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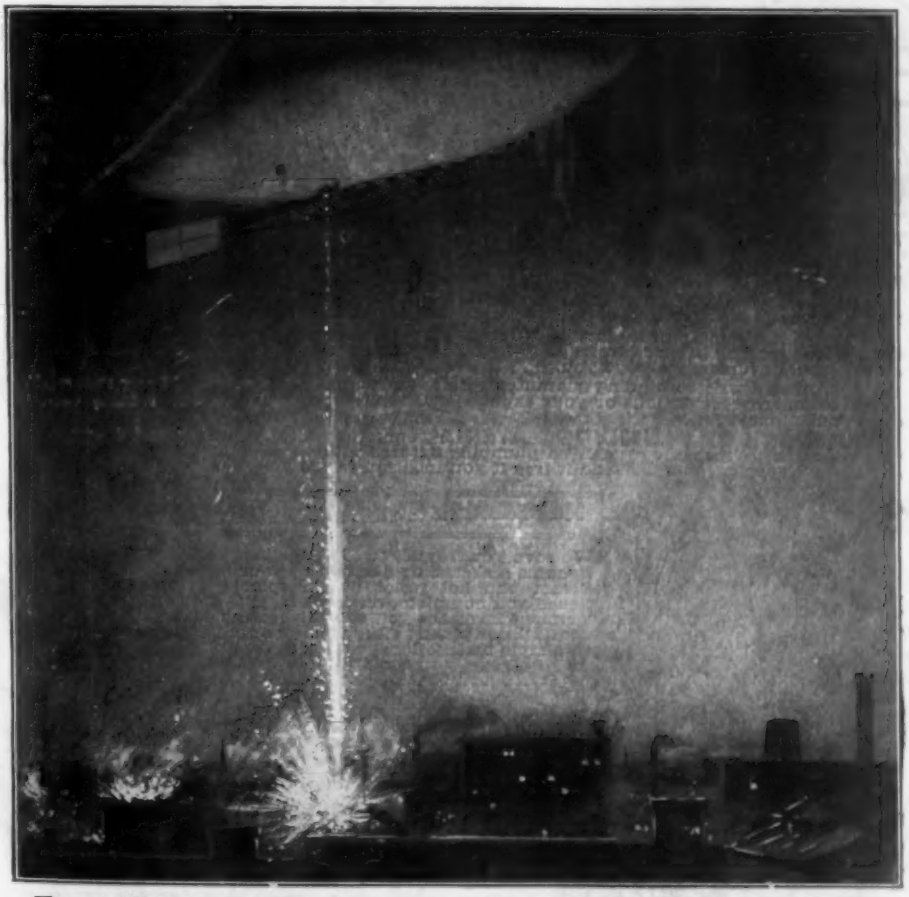

First (Tactical) Destruction of a Great City—See Page 151

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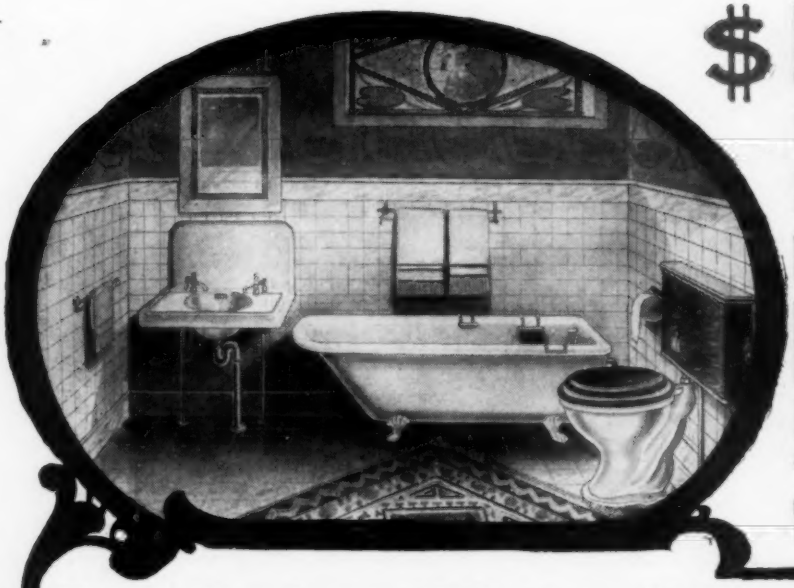

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POPULAR MECHANICS

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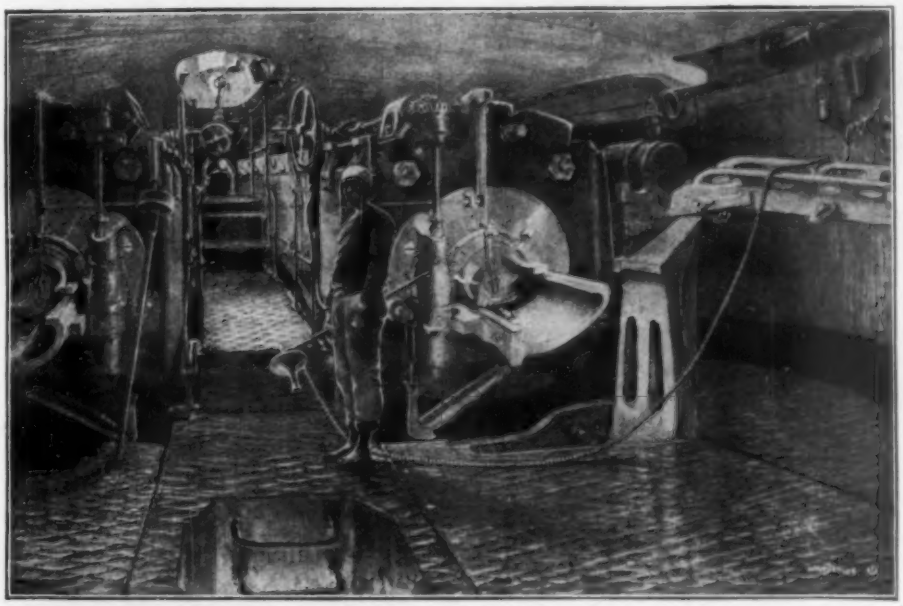


INTERIOR OF 12-IN. GUN TURRET OF FRENCH BATTLESHIP

This huge turret is not of the type which has been causing so many explosions on French warships, but one of the new 12-in. gun turrets on the most advanced battleships of the great European republic. At first sight it has but little of a warlike aspect, more resembling the interior of some factory with its complicated machinery than one of the most deadly weapons of war ever devised.

Each turret contains two of the huge guns, necessitating a crew of 6 men for each, or 12 men to a turret. The opening or shaft in the center of the floor, which is shown in the illustration, is the entrance to the turret. The bonnet worn by the gunner shown in the illustration is a worsted cap with heavy ear pads, some such device being necessary to protect the ear drums from the shock of the discharge. The strange looking device he holds in his hand is a compressed air blower, and is called a "marbec." Under the influence of the injected air the gases and refuse left in the gun chamber by a discharge are driven out. To the right of the illustration is shown a projectile ready to be deposited in the breech of the gun for the next discharge.

A HORN WITH AN ADJUSTABLE BELL

A band instrument manufacturing concern is now turning out horns with adjustable bells that can be turned in any direction, thus better controlling

The Bell Turns to Throw the Sound in Any Direction

the volume of sound and the direction in which it is thrown. When being played in a parade the bells can be turned toward the marching men, thus throwing the sound further along the marching line, and for concert purposes the bells can be so arranged as to secure a greater solidity and balance of tone. The bells are detachable as well as adjustable.

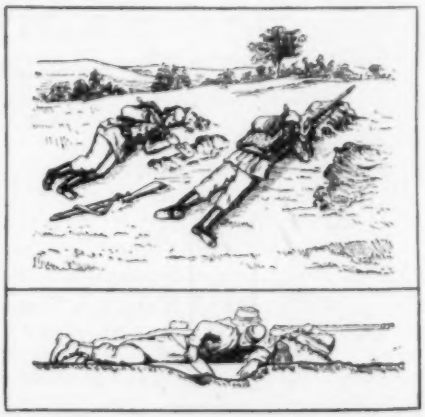
The bell of a horn is the sound chamber in which the harmonic intervals of sound are formed and by which the quality of tone is produced. Contrary to general belief, the metal of the bell does not vibrate, nor is the tone of the instrument created by metal vibrations. The vibratory air column in the bell divides and subdivides itself into harmonic intervals in response to the efforts of the performer, exactly in the same manner as a violin string does when the player draws his bow across it and touches the string with his fingers.

FORTIFYING THE BATTLEFIELD

Only a few years ago the fortification of a battlefield was considered only useful when on the defensive, especially in European armies, but the Russian-Japanese war proved otherwise, clearly demonstrating that it was almost impossible to be exposed to the enemy's fire without risk of being completely annihilated. Therefore, the infantry companies of the French and German armies, especially, are being trained to attack with their rifles and to defend themselves with their spades and picks.

In the French army the implements for defense while advancing against an enemy are shovels and picks for excavating earthworks, and hatchets, saws, hooks and shears for the destruction of obstacles. Each company of French infantry is now provided with 200 spades, 32 pickaxes, 16 hatchets, and 16 pair of shears. These are carried upon the knapsack or hooked to the belt, each soldier carrying some one of the implements.

In advancing against an enemy on a battlefield which does not present nat-



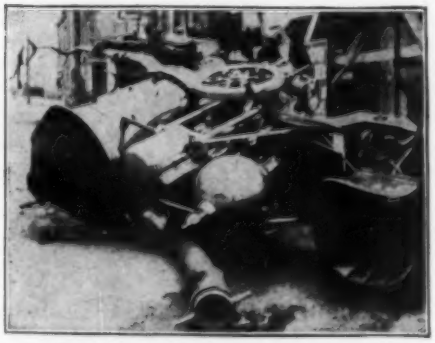
Constructing a Mask of Earth to Protect the Head—Digging a Trench for Closer Fighting

ural shelter the companies of sharpshooters are paired off, lying down the moment they stop. If the contending armies are not especially close together and the stops between advances are short a mask of earth to protect the head is sufficient. These are thrown up as shown in the first illustration, one soldier firing while the other is throwing up his mound of earth.

If the armies are close together and the siege a long one, a trench is dug as shown in the second illustration. The moment the advance stops one soldier commences firing while the other digs a trench with his spade, piling the soil up at the head of the trench as an added protection. When his task is completed he slides into the trench and opens fire, while his companion stops firing and constructs a similar trench in the same way.

THE WRECK OF A FIRE ENGINE

While running to a recent fire in San Francisco, this engine was capsized with somewhat disastrous results. A trip back to the factory will be necessary before it can again be expected to be of any use as a fire fighter.



HEADLIGHTS FOR BOULEVARD CLEANERS

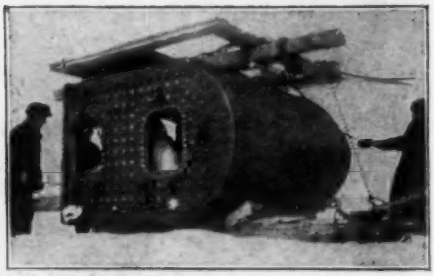
The man shown in this illustration is not a mine worker—simply one of the hundreds of the night working boulevard cleaners of Chicago who have either been bumped by speeding automobiles or just escaped by extraordinary agility.

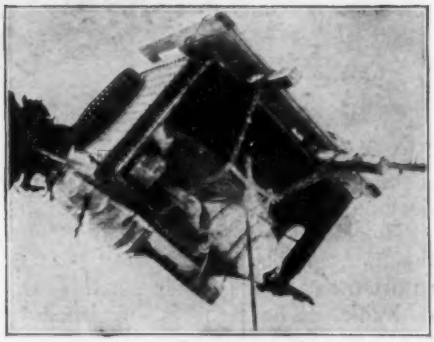
Safety Headlight

The lamps were introduced because the men complained of being bumped so often as to make their positions undesirable. The light is furnished by a storage battery which is recharged every day. "White Wings," the name by which street cleaners are known in probably every city in the United States, has now been dropped in Chicago and the men are now known as "fireflies."

WASTE 800,000 TONS OF COAL A DAY

According to Prof. John A. Holmes, of the Geological Survey, an enormous amount of coal is wasted every year in the United States because of the lack of improvement in mining operations. In 1907 the loss from this cause was 240,000,000 tons. In Europe improved mining conditions allow operators to remove from 85 to 100 per cent of available coal, while in this country only 60 to 65 per cent is taken out.





TRANSPORTING A STEAMER ACROSS FROZEN ALASKA ON SLEDS

Alaska has a number of inland rivers on which it is possible to navigate steamboats during the summer season, granting, of course, that the steamboats are available. But there are long stretches of barren and frozen land between accessible centers and these rivers, and the trails to be traveled are narrow. These photographs illustrate one part of the task of transporting a steamer across 65 miles of frozen land to the Copper river. The vessel, which is over 100 ft. long and the first to navigate the Copper river, was hauled in sections over the snow. The fire box, which is shown in the illustrations, was the heaviest piece, weighing a little over 3 tons.

It was placed on a specially constructed sled, drawn by three horses. The horses were driven tandem, the trail being too narrow for two horses to walk abreast. The first illustration shows the load starting out on its journey, and the second, the method of fastening the fire box to the sled. The third illustration shows one accident that was repeated many times, the camera snapping the load just as it was tipping over. In many places the trail was so narrow that it was impossible to keep one or the other runner from getting too near the edge. When this occurred the runner invariably broke through, and the load had to be pulled out with block and tackle.

The first day's journey was only a little over a mile, and on many other days the distance covered was even less than that, owing to accidents.—Contributed by Owen E. Meals, Valdez, Alaska.

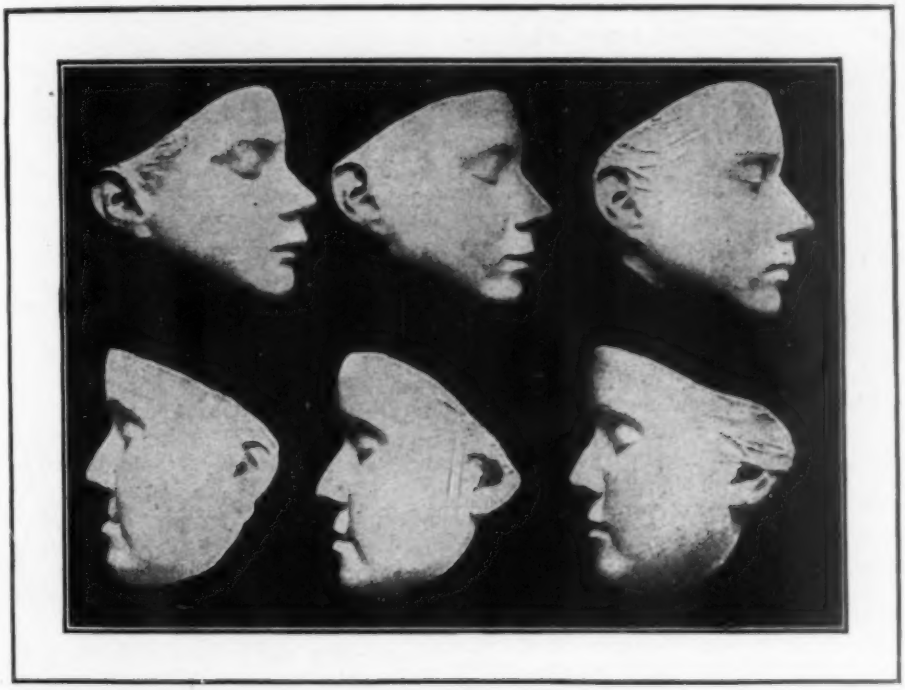
Illustrated News

When business is slack in this English stock exchange the members amuse themselves by attempting to throw a length of the paper tape, from the tape-machine, over the railing which runs round the great dome. Considerable skill and some strength are needed for the accomplishment of the task, as the dome is 100 ft. above the floor level.

REBUILDING THE HUMAN FACE

Changes Almost Miraculous Now Accomplished by Moving the Front Teeth—Hideous Facial Deformities Corrected—Treatment Requires Months and Sometimes Years

[Condensed from Lecture by Dr. C. S. Case in Dental Digest]



Two Cases in One of Which the Upper Teeth Were Moved Backward, and in the Other Forward—Patients Are Alive, but Were Obliged to Close the Eyes While Mask Was Being Taken

After a glance at the illustrations included in this article, which show unattractive faces made pleasing and repellent faces made less so, the wonders of orthodontia, which has to do with the movement of the roots of teeth to remedy irregularities, can be appreciated. Many of the most hideous facial deformities are caused simply by irregularities of the teeth, all of which can be partially remedied, and many made perfect. The course of treatment may cover a number of months or a number of years, according to the extent of the irregularities to be remedied and the age of the patient.

Of all the movements of the teeth in the practice of orthodontia, the bodily movement of the front teeth in phalanx to correct protrusions and retrusions is the most important. The wonderful results of this operation have proved to be within the easy accomplishment of almost any skilled dentist, and thousands of cases have been successfully treated. The next illustration shows the casts of a girl 17 years of age. The cast at the left was taken of the face at the beginning of the operation, and the cast at the right was taken 18 months afterwards. The operation was performed largely

Face of 17-Year-Old Girl Before and After Rebuilding

for the purpose of correcting the facial imperfections which gave to the features the appearance of advanced age. The upper teeth alone were moved in the operation.

The first illustration is a study of two cases in which the mal-positions of the upper teeth were exactly opposite to each other, one being a full upper protrusion and the other a full upper retrusion. In both patients the lower teeth were in normal position. In both of these cases the first stage of the operation consisted in moving the crowns alone of the upper front teeth. The effect of this movement upon the facial outlines, shown by the middle facial casts, is that which is often seen in these cases after supposed correction by ordinary methods. In the final casts is seen the effect of bodily moving the roots of these teeth.

The third illustration shows one of the most remarkable cases ever attempted, and although it is not yet completed, it has advanced far enough in its two years of treatment to show what the result will be. To the left is a cast of the face when the treatment was commenced, and to the right a cast taken at the end of two years.

Remarkable Case of Face Rebuilding

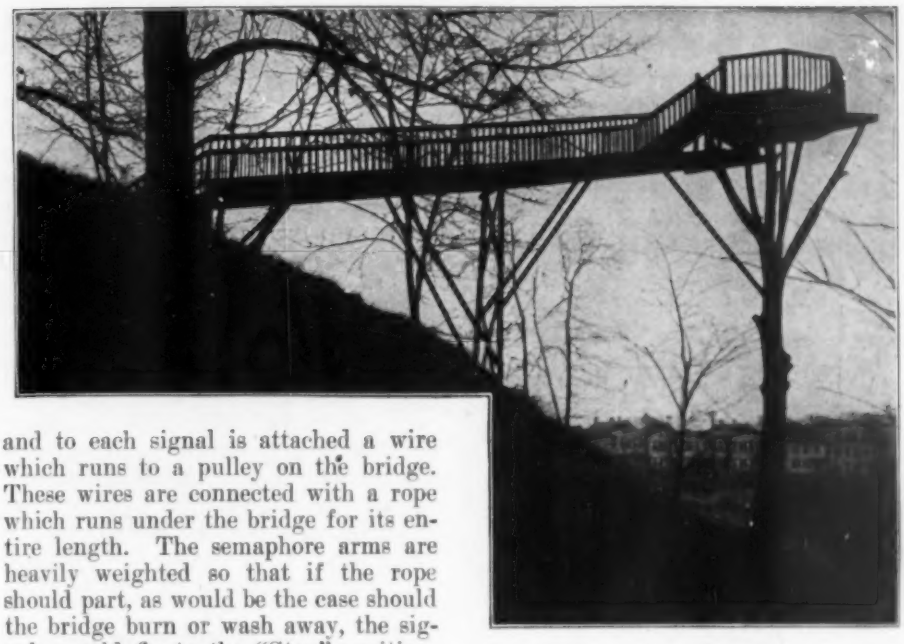
The patient was 24 years old when the operation started, and an extensive bodily movement of the lower cuspids was required. It was first believed that the movement would not be difficult, but it was soon found that with the most scientifically constructed appliances it was almost impossible to move the roots of the lower cuspids distally, and that any force, however low it was applied upon the crowns, or even upon the rootwise extensions, would at once tip the ends of the roots forward, unless these teeth were positively retained in an upright position with fulcrum bars at the apical ends. This consequently required an unusual force upon the anchorages. The incisors were moved bodily forward with the contouring apparatus, and the cuspids and bicuspids were forced to keep pace with the forward movement by the pressure of push bars from the anchorages. The result when the task is completed will be worth the trouble.

The movement of teeth backward or forward, and together and apart, is accomplished by the gentle but continual application of force, extending many months, and sometimes years. The movement to close wide spaces between teeth is much simpler, of course, than the movement forward or backward.

AUTOMATIC FIRE ALARM FOR RAILROAD BRIDGES

In more than one instance in American railroad history can be found records of fatal wrecks caused by the burning of a bridge in a wild or lonely district where the discovery of the danger was learned, not before, but after the train had plunged to destruction.

The possibility of such accidents has been provided against by the Canadian Pacific Railroad in the adoption of automatic alarms, designed to stop trains in case a bridge should burn. Semaphore signals are fixed about 3,500 ft. from the bridges, each way,

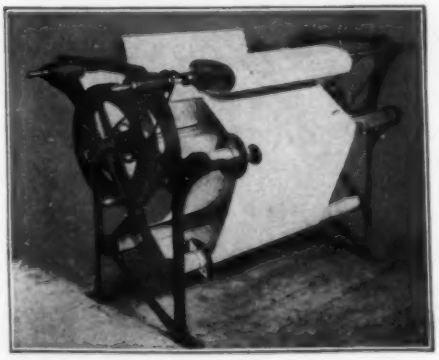


and to each signal is attached a wire which runs to a pulley on the bridge. These wires are connected with a rope which runs under the bridge for its entire length. The semaphore arms are heavily weighted so that if the rope should part, as would be the case should the bridge burn or wash away, the signals would fly to the "Stop" position. Track foremen are required to test the wires every day.

Two wooden bridges on the line west of Winnipeg have already been equipped.

MACHINE MEASURES BOLTS OF CLOTH

This machine was designed for measuring bolts of cloth. It unrolls the cloth from one bolt, measures it and then re-rolls it onto another.



The Measuring Machine

INGENIOUS TREE OUTLOOK

This ingenious tree outlook is situated on a high elevation at Tarrytown, N. Y., and gives a fine view of the Hudson River from the Palisades to the south and Croton Point to the north. The idea of utilizing the tree and its branches as a support is a novel one which could be duplicated in many localities to advantage.—Photo by Wm. C. Howe.

FIRE CISTERNS THAT FILL AUTOMATICALLY

Cisterns have for some time been a part of the fire-fighting system of Atlanta, Ga., but only recently were any of them equipped with automatic valves. The valve was first tested on the cistern in front of the Union station, with results highly satisfactory. The cistern has a capacity of 1,500 gal., and is connected with a 12-in. main through a 6-in. pipe.

Two engines were used in the test and as fast as the water was pumped out more flowed in, keeping the cistern full. The valve shuts off automatically

the moment the capacity of the cistern is reached.

HIGHEST CONCRETE STACK IN THE WORLD

Great Falls, Montana, has the distinction of having the highest concrete smokestack in the world, even though the work was done by a German firm. The stack, the foundation of which was illustrated in this magazine some months back, is 506 ft. in height, and weighs 34,000,000 lb., or 17,000 tons. It rests on a concrete foundation 25 ft. deep and 103 ft. in diameter. The diameter of the stack at the base is 78 ft. 6 in., and at the top 53 ft.

The stack is also claimed to be the largest piece of concrete masonry of any kind ever constructed.—Photo contributed by Edwin Lapeyre.

WIRELESS TELEPHONES FOR U. S. AIRSHIPS

It is understood that a wireless telephone system, invented in Detroit, Mich., has been experimented with successfully by the signal corps of the U. S. army, and that contracts have been signed for its installation on the army airships. The experiments proved that operators of dirigible airships and aeroplanes could talk with officers on terra firma from distances of five and ten miles.

It is also understood that the representatives of one European power have acquired the rights of the system for its army and navy.

THOUSANDS KILLED BY RAILROADS

Writers of accident insurance have made public statistics which show that, while there are 107,000 persons seriously injured and 10,046 killed annually on the railroads of America, the loss of life due to steam railroads in England, Germany and France is only 100 each year. The American list, however, includes electric as well as steam roads.

This disparity is ascribed to the hours of the employes on the foreign roads, to the limited schedules under which trains are operated and to the limited mileage of track.

In the last three years the annual average of accidents in New York on the surface, elevated and subway traction systems was 34,000 persons.

RUBBER-ASPHALT PAVEMENTS

Experiments covering a period of a couple of years have been made with a rubber-asphalt pavement in Paris and other cities of France, with results that seem successful. The material, as the name implies, is a combination of rubber and asphalt. The product gained is claimed to be more plastic and more adhesive than pure asphalt, and to resist higher temperatures. The two ingredients are mixed in special machines, in which the asphalt, reduced to a fine powder, is swelled and softened by a solvent. The finished material is a brown powder.

The rubber-asphalt is applied upon a foundation of concrete of a thickness varying from 6 to 8 in. The surface of the concrete is then cleaned and

covered with a thin coating of special material, which is laid on with brushes. The rubber-asphalt powder is sprinkled on this surface to a thickness of 1½ in., and then compressed by means of rammers. This done, the pavement may be immediately opened to traffic.

SUCCESSFUL SALVAGE OF THE "GLADIATOR"

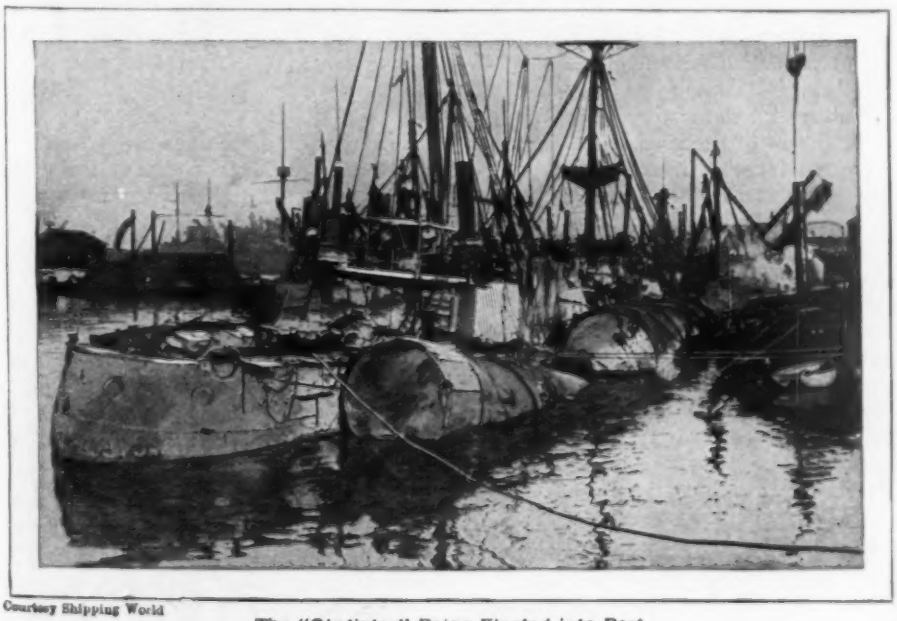
After five months of persistent efforts the British cruiser "Gladiator," sunk in a blinding snow storm in the Solent by the American liner "St. Paul," was successfully floated and towed to Portsmouth. The task of raising the heavy warship was one of the most difficult ever attempted by a salvage company.

The huge steel cylinders with which the vessel was righted and kept afloat are shown in the illustration. Four of them were used, having a combined lifting power of 650 tons. Each cylinder was 100 ft. long and 10 ft. in diameter. These cylinders, having been filled with water, were sunk and made fast to the submerged side of the "Gladiator" with steel hawsers. They were then emptied of water by a special process of air application and immediately became airtight and buoyant.

ESCAPE OF WATER THROUGH GLASS

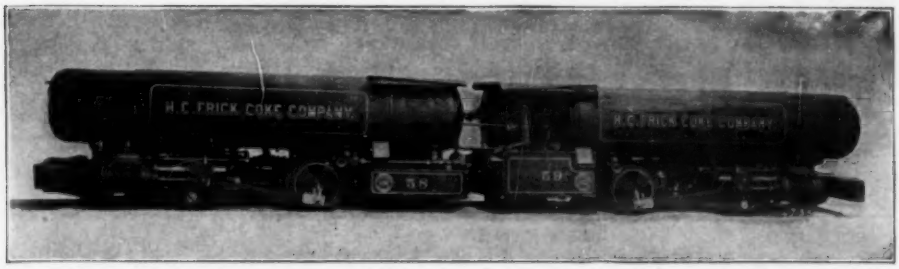
This glass globe, or ball, was filled with water in 1883 and molded up. At that time the globe was so full that not even a bubble remained. Now the water is nearly two-thirds gone, although there is no visible opening for its escape.

The reason for the globe is in itself rather interesting. During the early days of the Catholic church in California two priests were overtaken by a mountain snowstorm while on a missionary trip and perished. The globe contains a representation of this tragedy.—Contributed by Chester H. Steele, Seattle, Wash.



Courtesy Shipping World

The "Gladiator" Being Floated into Port



COMPRESSED AIR LOCOMOTIVE FOR MINES

Eight compressed air locomotives, of the type shown in this illustration, have just been completed for the H. C. Frick Coke Co., for use in one of the company mines. As it was practically impossible to design a single locomotive capable of meeting the required conditions, the locomotives are arranged to be operated tandem. They couple back to back, one operator controlling the two units by a single throttle lever, reverse lever, brake valve, etc. The locomotives are charged simultaneously by means of a flexible connection between the air tanks.

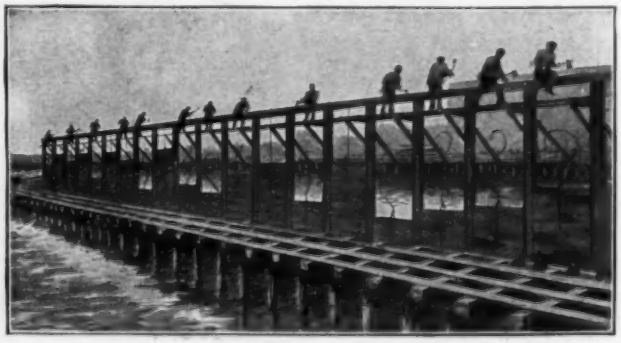
The same air pressure is maintained all the time, at 150 lb. per square inch, by reducing valves. The initial pressure of the storage tank is 800 lb. per square inch. Each locomotive is provided with two air tanks, one of which is shorter than the other, in order to allow room for the operator. The combined weight of two locomotives is 46,400 lb.

METHOD USED IN CLOSING THE CHARLES RIVER DAM

The most interesting event in the construction of the Charles River dam at Boston and Cambridge, Mass., occurred in October, when the gates of the "shut-off" dam were dropped and the tidal flow of the river basin stopped.

A large force of men were stationed upon a platform built near the top of the gate guides, and at a signal from the governor of the state the ropes holding the gates were cut. In seven seconds from the time the signal was given the gates were all in place and the flow of water stopped. The illustration shows the shut-off dam at the instant of cutting the ropes, some of the gates being still suspended, some falling and some closed.

The capacity of the Charles River basin, between mean low and high water levels, is 323,000,000 cu. ft., the normal range being about 10 ft. With this enormous quantity of water ebbing and flowing twice daily it was impossible to deposit the earth to form the dam and have it remain in place. It was

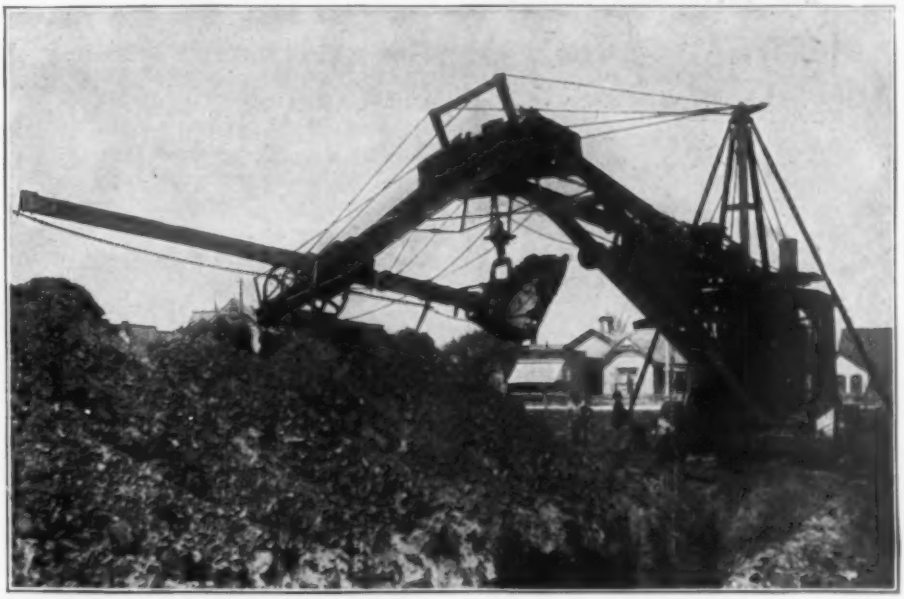


Releasing the Gates of the Shut-Off Dam Which Stopped the Tidal Flow of the River Basin

therefore necessary to construct a shut-off dam which could be closed all at one time. A few minutes after the gates were dropped into place a number of dredges and rehandlers were busy heaping earth against the structure.

BACK-ACTION STEAM SHOVELS FOR EXCAVATING TRENCHES

A back-action steam shovel for trench excavation has been used with great success in constructing a sewer at Allegheny, Pa., the advantage claimed for it being that the machine runs backward on undisturbed ground instead of straddling the trench.



Machine Digs Trench 10 Ft. Wide and 18 Ft. Deep

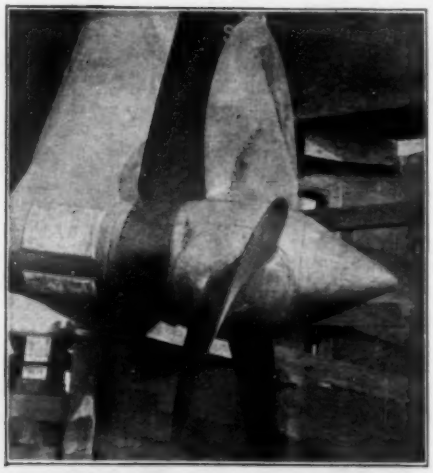
The machine is simply a steam shovel, fitted with a special crane designed to operate a dipper of the back-action type. The machine works backward and digs toward itself, the desired back action being obtained by operating the hoisting chain over sheaves at the knuckle of the crane. The dipper, which is forced into the bank by a belt friction operated by the crane attendant, has a capacity of 1¼ cu. yd., dumping to a height of 10 ft. and to a distance of 14 ft. from the center of the trench on either side. The machine is capable of digging a trench 10 ft. wide and 18. ft. deep.

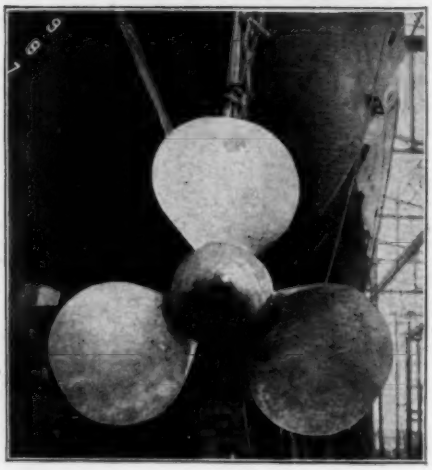
It is claimed that such a shovel eliminates a great amount of the expense ordinarily required for bracing and sheeting, and that it works to advantage in soil altogether too soft to hold up an ordinary steam shovel straddling the trench. The sides of the trench are left open and free, and, being relieved of the weight of the machine, the danger of side cave-ins is greatly reduced.

AMERICA'S FIRST GREAT "DREADNOUGHT"

The huge propellers shown in this illustration are expected to drive the United States steamship "North Dakota" through the water at a speed of not less than 24½ miles an hour. The shape of the blades is somewhat unusual, and, from a rear view, each propeller looks like a 3-leafed clover.

The "North Dakota," a drawing of which was published in the January





Side and Rear Views of "North Dakota" Propeller

issue of this magazine to illustrate the new American fighting-tops, is the first of the great American "Dreadnoughts." Its length is 519 ft. and it has an extreme breadth of 85 ft. Its trial displacement is 20,000 tons. When completed she will have a main battery of ten 12-in. breech-loading rifles mounted in turrets en barbette on the center-line, thus permitting all of the big guns to be fired on either side. Two of the turrets are also on a higher level than the others, permitting these guns to be fired over the lower turrets.

In addition to the main battery of big guns the "North Dakota" will have a secondary battery of smaller guns for repelling the attack of torpedo boats and destroyers, and a number of submerged torpedo tubes.

The speed required by the government for this huge fighting machine will be 24½ miles an hour, but it is expected that even this great speed will be exceeded, as she will be equipped with powerful turbines of the type which proved so remarkable on the United States scout cruiser "Salem."

ENGLISH TIRE-TESTING DEVICE

A device is being used by an automobile manufacturing concern in England which absolutely tests the tires under actual driving conditions as used upon an ordinary hard road surface, and, better still, subjects them all the time to just the sort of stresses which are thrown upon a tire when turning corners at high speed. Turning corners at high speed is highly destructive of tire material.

The apparatus runs on a circular track 130 ft. in diameter, thus giving about 13 circuits to the mile. The rails are laid in the center of a strip of macadam roadway. The testing apparatus is rather a unique car composed of the framework of an ordinary 40-hp. car, with a solid superstructure erected upon it, regardless of weight or appearance. The front axle and wheels are replaced by a 4-wheeled, balanced and pivoted truck. The engine of the car has been replaced by an electric motor, which receives the current through a flying double wire running to a central revolving pillar in the center of the track circle.

Tests Tires Under Actual Driving Conditions

The tires to be tested are fitted to the ordinary rear wheels of the machine, which are driven through the usual transmission gear. Two people may ride in the car if desired, but when running at a speed of 30 miles an hour the centrifugal force is sufficient to make it difficult for a person to retain his seat. The steering is done automatically by the forward wheels.

A WOMAN MONUMENT MAKER

Letters in Seven Languages with Equal Facility

The little city of Ashland, Ore., has the distinction of claiming the only woman monument worker west of the Mississippi river, and, as far as is known, in the United States. Ashland has also an additional cause for pride in the fact that this active worker is not only a woman, but a woman 70 years of age. She is Mrs. A. H. Russell, and has carried on the business alone since the death of her husband 10 years ago. Mrs. Russell never served a regular apprenticeship at the trade, but just naturally picked it up while her husband was alive. Her principal skill is in monumental carving and lettering, and she can letter in English, Italian, Spanish, Latin, Greek, French, and Hebrew, with equal facility.

Mrs. Russell and Monument She Carved

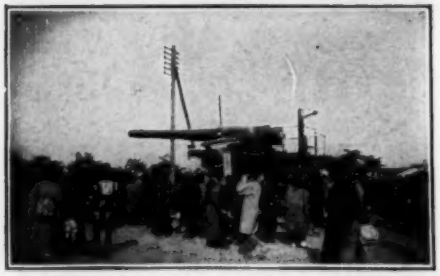
SHAVING WITH AN AXE

All London is gasping at this new American "hair-raising" act, now being presented in one of its theatres. As one of the many things that can be accomplished with an axe, Jackson, a champion woodsman is proving to a startled audience the ease with which he can shave all who apply.

An Expert in the Use of an Axe

PHOTOGRAPHS FROM CHINA AND JAPAN

Views from China and Japan are always interesting, as these two countries, although of the same general race, represent vast extremes. China was a world power a few thousand years ago, but has been sleeping for centuries,



Street Parade in Yokohama—An Elephant Tomb at Nanking—Big Gun Captured by the Japs in War with Russia

while Japan is the latest nation to lay claim, and with some reason, to being a modern world power.

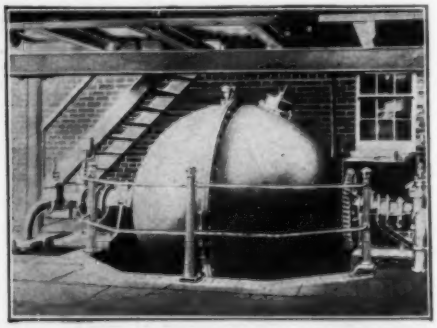
The first of these illustrations depicts a street parade in Yokohama, Japan, and the second—a stone elephant—one of the many unique tombs just outside the walls of Nanking, which was the ancient capital of China. The soldier on the pony is a United States marine out seeing the sights. The third illustration shows one of the big guns captured by the Japanese in the late war with Russia. It is mounted in one of the parks of Tokio.

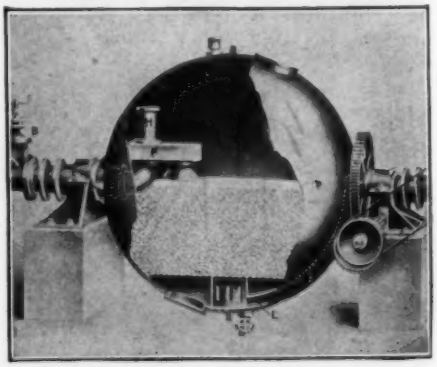
The census of the United States for 1910 will cost the government about $14,000,000.

SPHERICAL FILTER CLEANED BY A ROTARY MOVEMENT

The principal difficulty experienced with mechanical or rapid filters has been the more or less imperfect methods of cleansing the filtering bed. Various washing arrangements have been devised for this purpose, such as the injection from the bottom of streams of cleansing water at high pressure, and revolving arms and rakes. None of these methods have given complete satisfaction, however, but a new turnover type of filter, invented and now in use in Scotland, is claimed to overcome all difficulties.

The turnover filter is spherical in construction, and, as its name implies, is cleansed by a rotating process, during which the filtering bed of fine indestructible quartz is completely reversed with each revolution of the filter. The scouring action, accompanying the shifting of the quartz, is claimed to be a distinct merit, as it effectively removes





Exterior and Interior Views of Filter

all adhering matter from the inside of the filtering receptacle, at the same time throwing to the surface a new portion of the filtering body.

All the operating gear is outside the filter, and is visible. The filters are generally constructed of cast iron in preference to steel plates. It is claimed that large types of filters, with a capacity up to 30,000 gal. per hour, clean as easily as the smaller types.

CAMP-STOOL LIFE PRESERVER

A camp stool which can be quickly converted into a life preserver should an accident occur has been designed for excursion steamers to take the place of the ordinary life preservers that are invariably stored away overhead and under cabin seats.

The new life preserver is in the form of an ordinary camp chair with a solid block of cork ingeniously placed underneath the seat. All that is necessary when occasion demands is for the passengers to pick up the chairs on which they are sitting, pass the straps around their bodies and drop into the water. The loss of time in the often unsuccessful attempt to reach life preservers when an accident occurs is eliminated by the use of the camp-stool preserver.

Life-Saving Camp Stool

RAISIN CROP IN CALIFORNIA

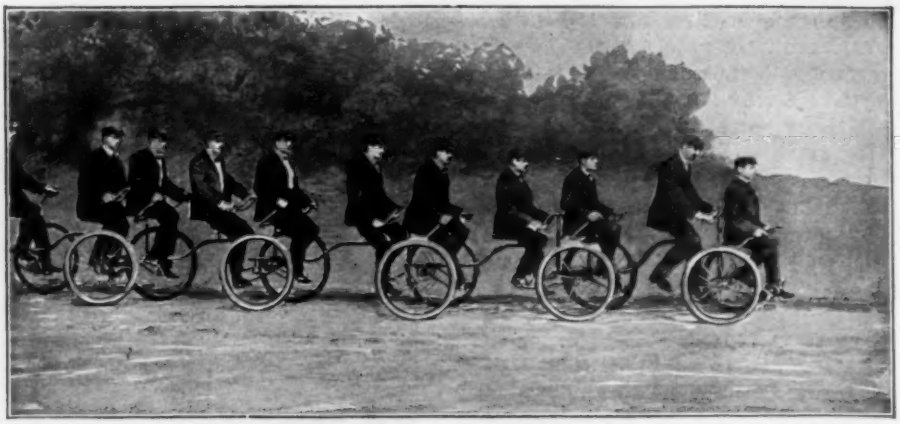
The season's return on raisins in the Californian counties of Fresno, Kings,

Curing Raisins in the Sun

Tulare and Madeira is annually over $6,000,000. This illustration shows several acres of grapes being converted into raisins by the heat of the sun.

INDIANS AS TRACK LABORERS

As section laborers, the American Indian is claimed to equal the best of the foreign laborers, such as the Italians, Greeks, Austrians and Macedonians, the nationalities from which are drawn nearly all the track laborers used in the United States. Not only is the Indian claimed to be an equal of the foreign product, but superior to all laborers as far as tractability and will-



Blind Men Touring on a Multi-Cycle

ingness are concerned. They always obey any reasonable command exercised by proper authority, and no interpreter is required to make them know what is wanted, as they understand signs nearly as easily as a white man understands words.

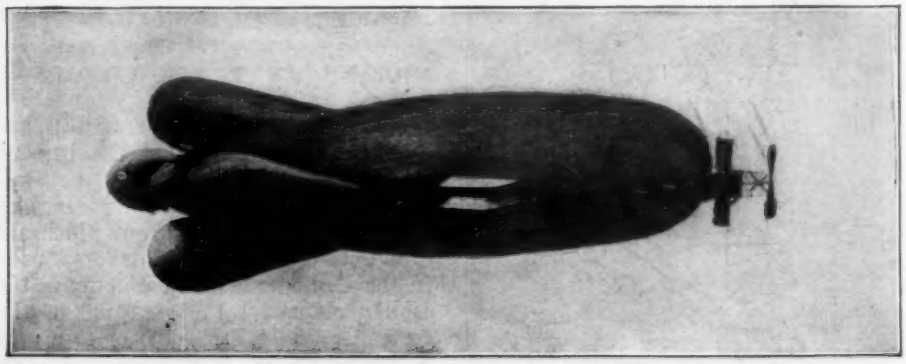
It has only been in recent years that an opportunity has been given this race of people to demonstrate its ability in the various fields of skilled or unskilled labor. For many years Indians were not even considered worthy, or possessed of the ability or intelligence to perform the most simple kinds of manual labor.

A MULTI-CYCLE FOR THE BLIND

An English institution for the blind has acquired a number of multi-cycles of the type here shown for the outdoor exercise of its inmates. Each machine seats 13, and with 26 feet working the pedals they run very easily and smoothly. The leader is of course an attendant and can see. The pairs of wheels are mounted upon independent axles, so that the long machine can be easily turned about or driven along winding paths.

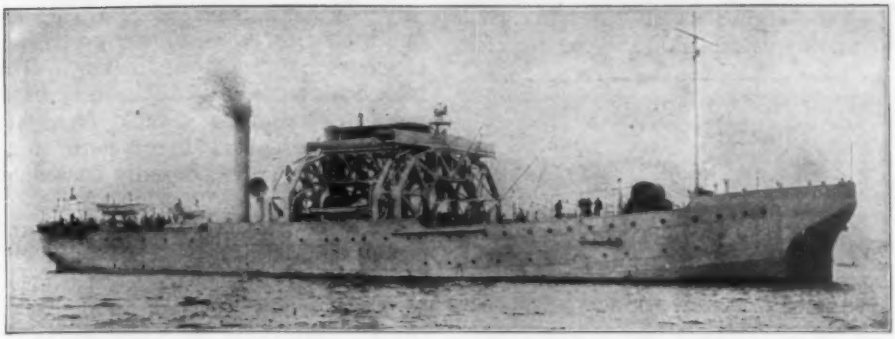
AN EXTRAORDINARY APPEARING DIRIGIBLE AIRSHIP

The "Clement-Bayard," one of the latest of the French dirigible balloons, is without doubt the most curiously shaped of all the lighter-than-air type of airships. This curious air craft is about 190 ft. long, 35 ft. in diameter, and is driven by a 120-hp. motor. It has made a number of successful trial flights.



Most Curiously Constructed of all Airships

LATEST SUBMARINE-RESCUING VESSEL



German Wrecker for Raising Lost Submarines

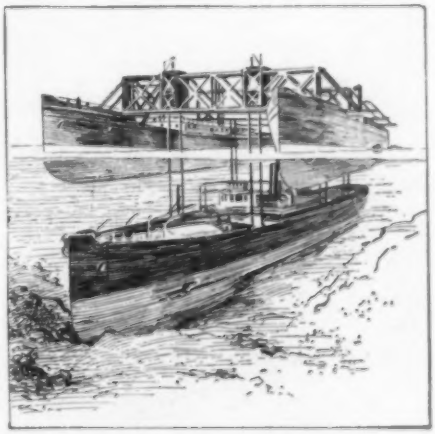
Every great navy in the world now has a large and more or less growing flotilla of submarine vessels, and as the number increases, the danger of serious accidents under water becomes more probable. This curious appearing ship, which is one of the latest additions to the German navy, was designed for no other purpose than to rescue submarines from the bottom of the sea, should the necessity arise.

The opening in the bow of the vessel, which is shown in the illustration, runs clear through to the stern. The ship is run directly over the submarine and chains are made fast. The central mechanism raises the submarine until it rests above water on bars which bridge the open space. Repairs are immediately begun, and after they are completed the submarine is allowed to drop into the water again.

The actual construction of this wrecker suggests possibilities for larger craft to raise big vessels. Although many conditions might make such a method impracticable, it is certain that great lifting power would thus be available. Powerful lifting drums are located in the connecting girders. The idea here illustrated calls for three connecting bridges and six lifting drums.

TO STOP TRAINS BY WIRELESS

The Union Pacific Railway believes it has a sure preventive of collisions on its road in a wireless signal system invented by one of the electrical engineers in its Omaha shops. It is claimed that the invention has been so far perfected that it will send a wireless message 180 miles and register a signal in the cab of any specified locomotive on the line. The signal in the cab consists of a red light and a bell. If practical installation proves as satisfactory as the experiments lead the inventor to believe, it will be possible for station agents to signal trains anywhere between stations and warn the engineers of danger.



Plan for Raising Large Ships

INGENIOUS CULINARY UTENSILS

The average housewife in America probably spends as much of her time in the kitchen and dining room of her

The Men Will Appreciate this Invention

home as in any other part of the house. To prepare and serve three meals a day, year in and year out, is not the easiest task in the world by any means, and therefore all culinary utensils that tend to lighten the household burdens are hailed with delight, if practical and not too expensive.

The culinary utensils described in this article are a magic cooker, a churn that will make sweet butter in less than a minute, a self-basting roaster, an automatic baster, a device for beating up foodstuffs, and an English meat pie funnel. Mention is also made of an English "At Home" cup and saucer, and asbestos mats for dining room tables. The saucer solves a sometimes

Folding Asbestos Mat

difficult problem in "At Home" serving, as at such affairs refreshments are held in the lap. The saucer is twice as long as it is wide, thus providing a place for sandwiches or cakes, and a protrusion at one end suffices to hold it by. The table mat, made of asbestos and heat-proof felt, protects a table from hot dishes. It is made in two parts so as to avoid the creases usually caused by folding.

The first three illustrations in the group show a fireless cooker and the utensils that fit inside of it. It is made of quartered white oak, and has a strong, convenient steel top that seals the cooker airtight by a turn of the eccentric knuckle. The cooking receptacle, shown in the second illustration, is arranged to rest on a steel rim, so that the can does not come in contact with the jacket, thus leaving a vacuum chamber between the outer and inner wall. After the article to be cooked is properly started over a fire, it is transferred to the fireless cooker and the top screwed down. It will then cook steadily for hours, and yet cannot be overcooked, burned, or spoiled by leaving it in the cooker an indefinite time. Porridge placed in the cooker at night will be found well-cooked and hot at breakfast time the next morning.

The fourth illustration in the group shows a churn of 1-qt. capacity that will turn out sweet butter in less than one minute. In churning, the jar or tub is only half filled with cream. A special household size holding 1 gal. is also made.

The fifth and sixth illustrations show a self-basting roaster, and an automatic roaster of another design. In the former, small indentations in the dome collect and condense the moisture from rising vapors and precipitate it uniformly over the entire surface of the roast. In the latter, a percolator picks up the juices from the inclined bottom of the roaster. The water, or juice, in the roaster, boils in an aluminum plate which is part of the percolator, gradually forcing the juices up the pipe, from which it is sprayed over the roast.

The seventh illustration is a device for whipping cream, and beating eggs, butter, and other foodstuffs. With a single turn of the crank the wire beaters, of which there are eight, make several revolutions. The standard is designed to be securely fastened to the kitchen table by means of a thumb screw.

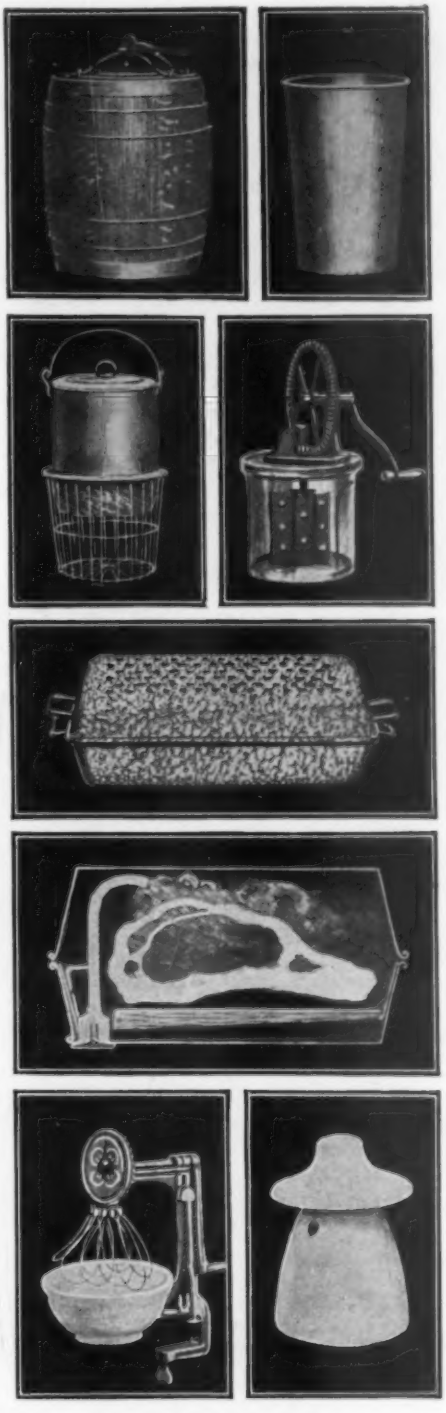
The last illustration in the group shows a funnel for use in cooking English meat pies. Pie in England means "meat pie," as the American pie is almost unknown there. The funnel is designed to prevent the ingredients from boiling out of the pie and to keep the pastry from becoming sodden.

THE WASTING OF NATURAL RESOURCES

In the report of the mineral section of the United States Geological Survey before the National Conservation Commission in Washington, Dec. 9, attention was called to the fact that one-half the natural gas now coming out of the earth in the United States, about 1,000,000,000 cu. ft. per day, or more than enough to light all the cities of the United States having more than 100,000 population, is wasted by being allowed to escape into the atmosphere. This immense waste, so the mineral section claims, can be prevented by adequate state legislation similar to that now enforced in Indiana and one or two other states.

Attention was also called to the waste of material which is to a considerable extent preventable in the mining and extraction of the various metal mining industries, such as lead, zinc, copper, gold, silver, and especially coal. The aggregate of all these products of mineral waste for the year 1907 is estimated to approximate $1,000,000 per day in value.

Stress was brought to bear on the fact that these mineral resources have required untold ages for their accumulation, that no human being has contributed toward this accumulation, and

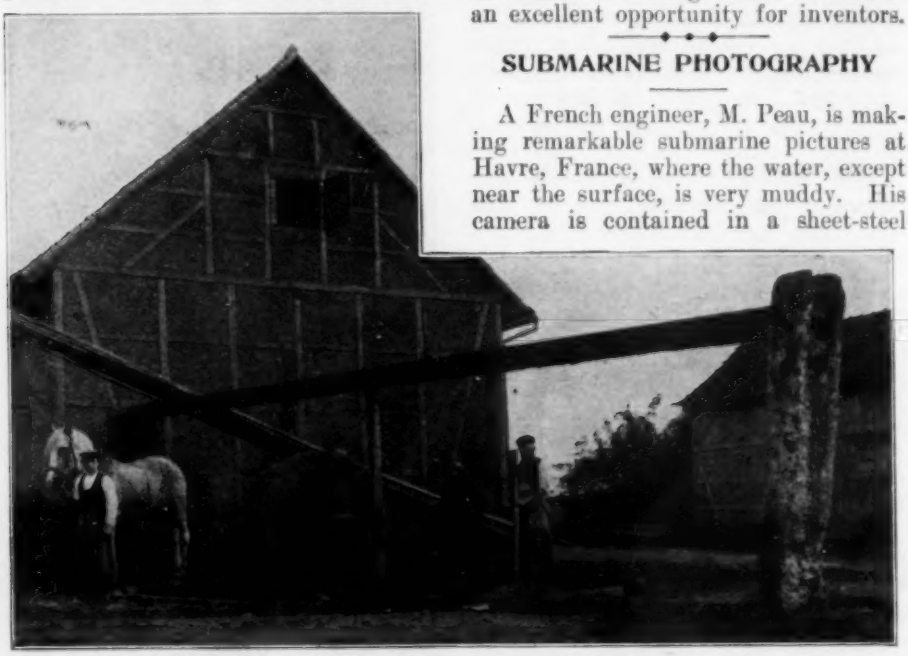


Latest Cooking Machines

hence their present owners, whether acquiring them through purchase or discovery, have no right to waste or destroy that which is necessary to the welfare of the nation. Such natural resources they did not create and cannot replace.

THE LAST OF GERMANY'S ANCIENT INDIGO MILLS

In the middle ages indigo was planted extensively in many parts of



The Last of an Interesting Industry

Germany, the cities of Erfurt, Gotha, Langensalza, Tennstadt and Arnstadt being known as the Indigo Cities. This illustration shows what is claimed to be the last of the indigo mills. It is located in Langensalza and is shortly to be torn down. The leaves from which the indigo is made are placed in the path of the huge stone roller.

The French government has voted $20,000 with which to begin the establishment of a system of garages for airships along the principal aerial routes of travel in France.

SELF-CLEANING LOCOMOTIVE ASHPANS MADE COMPULSORY

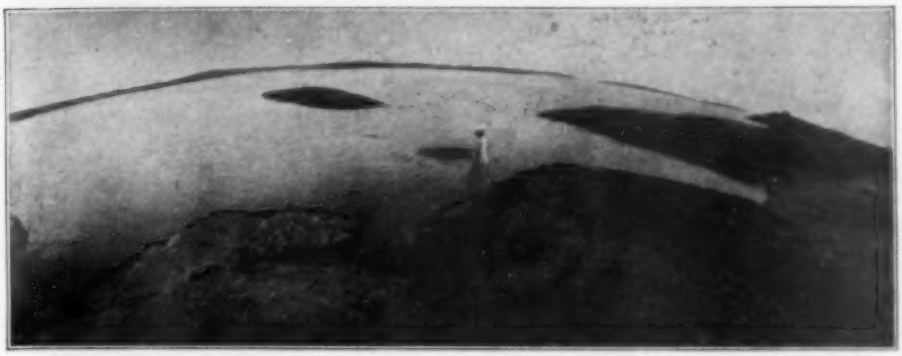
Congress has passed an act requiring all railway locomotives to be equipped with some form of self-cleaning or self-dumping ashpan, the idea of the act being to protect firemen and engineers. The law will go into effect Jan. 1, 1910, and it now remains for mechanical men to develop a type of ashpan that can be cheaply built and easily installed, at the same time being durable. This is an excellent opportunity for inventors.

SUBMARINE PHOTOGRAPHY

A French engineer, M. Peau, is making remarkable submarine pictures at Havre, France, where the water, except near the surface, is very muddy. His camera is contained in a sheet-steel cylinder 20 in. long and 10½ in. in diameter. The front is covered by plate glass. Into the rear of the camera runs a tube which extends to the surface of the water, and it is through this that the engineer changes the plates and focuses the lens. Illumination is furnished by flashlights contained in a thick glass globe which is also connected with the surface by a tube. The shutter and flash work simultaneously.

The complete apparatus weighs about 4 lb., but when in the water is held down by additional weights ranging from 20 to 40 lb. The apparatus is

CAMERA SHOWS THAT THE WORLD IS ROUND



This remarkable photograph was taken by Dr. A. H. Ruedy, of Portland, Ore., ostensibly to show that the earth is round. It is a "freak" photograph, of course, and a convincing evidence that the camera is not always to be relied upon as an impartial witness.

painted as near the color of the water as possible, so as not to arouse the inquisitiveness of the fish.

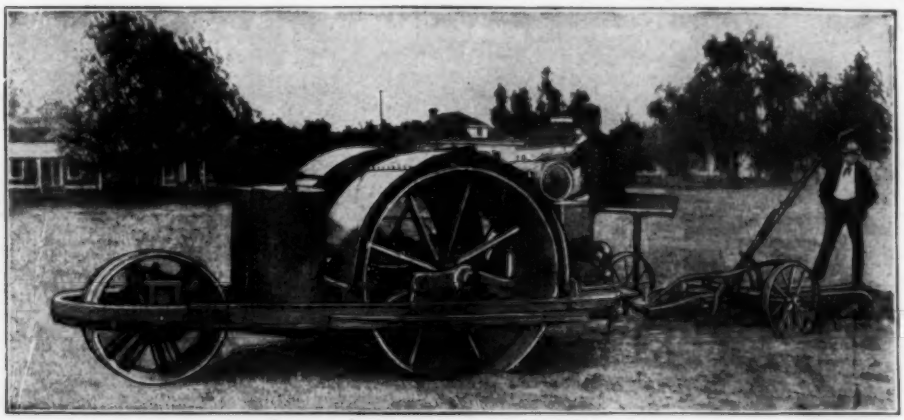
AN ARTISTIC LIFT BRIDGE

The counterpoise of this bascule bridge is the solid block of concrete between the two towers. As the bridge rises this block moves downward. The approaches are constructed of steel, covered with white concrete. This gives the effect of marble at a distance. The bridge is at Camden, N. J.

RUNNING COST OF AUTO FIRE APPARATUS SMALL

The last annual report of the Springfield, Mass., fire department places the running expense of automobile fire apparatus at a much lower amount than for horse-drawn apparatus. As a means of getting to and from fires the report refers to the work done by the automobile of Auxiliary Squad A, and the 2-horse team of Truck No. 2. The auto apparatus did twice as much work at half as much expense as the team of

Engineers Consider This a Very Handsome Bridge



Latest Motor Plow—The Wheels Are 2½ Ft. Wide

horses, the former responding to 210 alarms and covering 1,145 miles, the latter responding to 51 alarms and traveling not more than 300 miles. The auto apparatus cost $103 to operate, and two unusual accidents necessitated repairs amounting to $172, a total of $275. The keep of the horses cost $498, exclusive of harness and repairs.

"BEATING" THE RUSSIAN RAILROADS

It would seem that in Russia where every petty offense may land the culprit in Siberia, or at least in serious trouble, its people would fear to "beat" the railroads, but according to Russian newspapers the travel on counterfeit tickets is appalling. It is claimed that on many routes scarcely one passenger in five has a regular ticket, but rides on a counterfeit ticket, or a ticket already used, with the connivance of the conductors, who receive a small fee.

AUTO FARM TRACTOR AND PLOWING ATTACHMENT

This automobile farm tractor is one of the latest designed in the west, and is being used successfully in California. It is simple in design, a heavy wrought and cast-iron frame forming a foundation which is carried on four wheels. The driving wheels are 5 ft. in diameter and 2½ ft. wide. The front wheels, which are practically one wheel, made in two sections to facilitate turning, are each 3 ft. in diameter and 1 ft. wide. The arrangement is such as to afford a three-point support on the ground, with the further advantage that the front pair of wheels exactly track the space between the two rear, so that all the ground is subjected to the rolling.

The tractor is driven by a 35-hp. gas engine and will drag a 10-furrow plow.

A TABLE FOR CAMPS

The only kind of hunters or campers who scorn the advantages of civilized living are the amateurs, and even they grow less disposed to living without civilized utilities after a few days of their trip have elapsed. It is almost impossible, however, to carry tables, chairs and other furniture along on such trips,

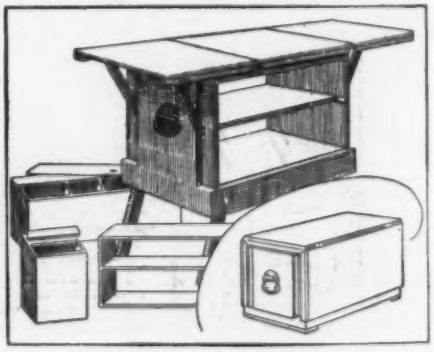


Table Folds Into Box

because of the bulkiness of the objects and lack of room, but this invention makes the table possible, at least. It is a collapsible table that will fold up into the form of a box, as shown in the illustration, and as such can be easily carried.

U. S. NAVY MAY HAVE 14-IN. GUNS

Anticipating the possible need of a more powerful gun than any now in use, Rear-Admiral Mason, chief of the bureau of ordnance, favors the partial remodeling of the gun-shop factory at the Washington navy yard in order to construct immense 14-in. guns, designed to fire 1,400-lb. projectiles.

The biggest gun in any navy at the present time is the 12-in. type, and of this sized gun those mounted on eight of the latest U. S. battleships already in commission are claimed by the department to be equal, if not superior, to the 12-in. guns of other navies.

FALLING WATER TANK WRECKS TWO BUILDINGS

A steel water tank, weighing 120 tons, fell recently from the roof of an 8-story building in St. Joseph, Mo., cutting a clean swath through floors and outside walls for the entire distance, and wrecking the rear wall of a brick store building 150 ft. distant. The pathway cut through the eight floors of the building on which the tank stood was 16 ft. square.

The tank was of steel, 22 ft. in height, 18 ft. in diameter, with a capacity of 40,000 gal. The building on which it stood had just been completed, and the tank was being tested. About 30,000 gal. of water had been run into the tank when the platform, 16 ft. above the roof, gave way. The tank shot straight downward to the basement, carrying everything in its way, and struck the ground intact. The force of the contact with the ground burst the tank, and the water, as if shot from a cannon, leapt across a space of 150 ft. and tore through the wall of the store, flowing through to the front and out into the street, a distance of 75 ft. more.

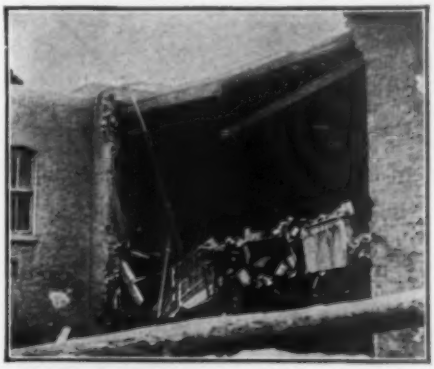
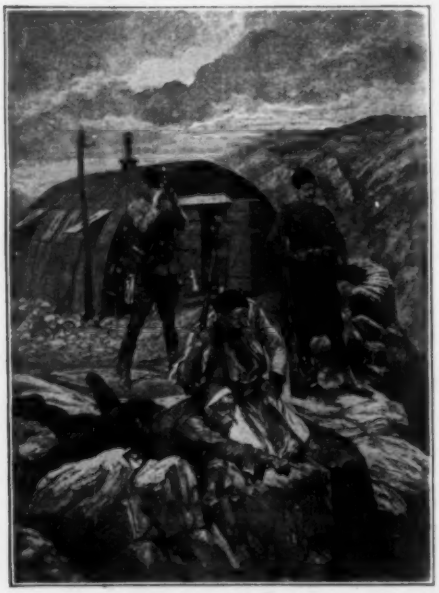


Photo by Wm. Shaw

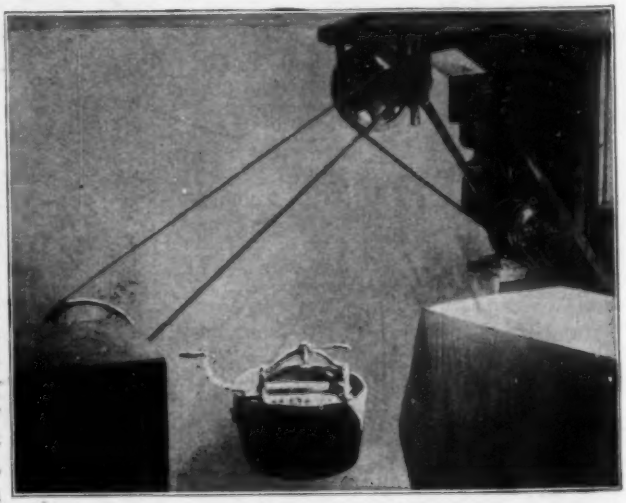
Showing 16-Ft. Cut Made by Tank as It Crashed from Roof to Basement—View of Rear Wall of Store 150 Ft. Distant Wrecked by Water



The recent disturbances in the Balkan States make this illustration especially appropriate. The hut, or cabin, shown in the background, is in reality a steel fortress, one of many along the Bosnian and Herzegovinian frontier of Austria. The cabins are bullet-proof and each of them house a garrison of eight or ten Austrian soldiers and Herzegovinian and Bosnian spies in the pay of Austria. It is the business of these garrisons to report movements of troops, or bodies of men.

POWER-DRIVEN LAUNDRY

The accompanying picture shows how to fit up the home laundry room with electrical power that will do the hard labor. This home laundry as shown in the photograph was fitted with a ¼-hp. electric motor which runs a countershaft. The countershaft runs in bearings that are fastened to the joist. From this countershaft belts may be run to a washing machine, wringer or mangle. Such an outfit can be rigged up at a cost of about $50. When selecting a motor be sure to know what kind of current is to be used. Direct current motors will not run on an alternating current system, and vice versa. Alternating current motors must have the same alternations or cycles as the dynamo furnishing the current.



Motor Driven Washing Machine

LIMIT OF SAFETY IN STORED COAL

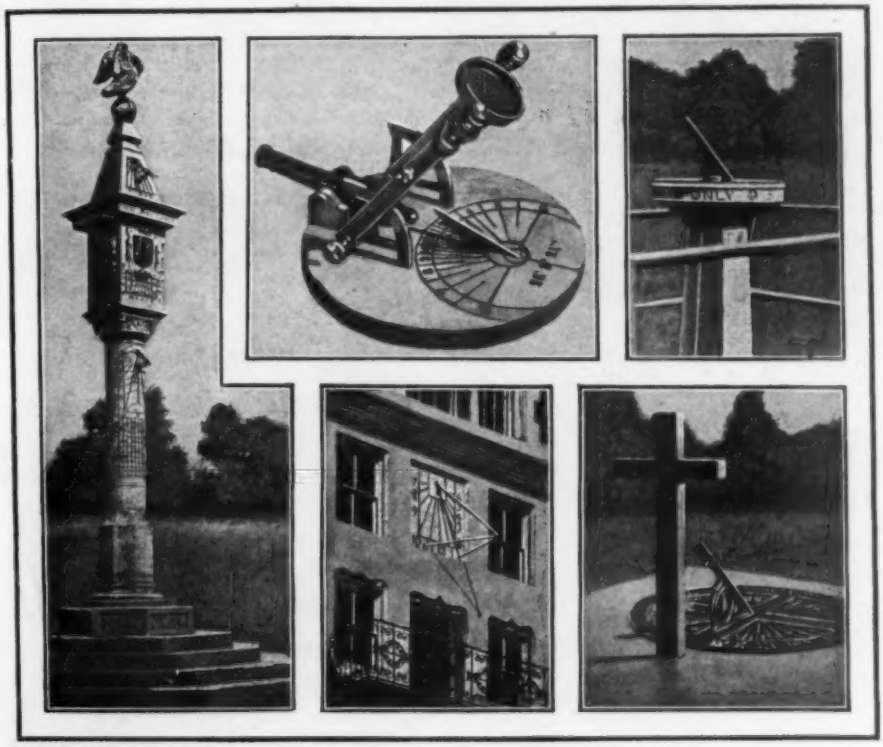
The temperature of a coal pile rapidly increases after reaching 150 deg., and there is no doubt but that coal must be moved when it has reached 212 deg., or some step be taken to cool it in order to prevent fire. Temperatures as high as 485 deg. have been observed, but at this temperature coal will ignite when exposed to the air.

The usual method of determining the temperature of a coal pile is by driving pipes and hanging thermometers in them, but this has been improved upon by means of a spiral coal auger with a small maximum thermometer inserted near the point. Extensions, about 4 ft. in length, for convenience in carrying, may be attached to the auger so that the thermometer can be driven to any depth in a pile. About 10 minutes is required for the thermometer to attain the temperature of the surrounding coal.

EARLIEST METHOD OF TELLING TIME IS LATEST FAD

The sun dial, which is the most ancient of all devices for telling time, is having such a popular revival that its manufacture has become quite an industry. The real cause for this revival is, of course, its adaptability as an artistic ornament, but it is also extremely useful. For people living in the country, or other places where opportunities for obtaining standard time are infrequent, the sun dial affords a means for setting clocks. If the dial is carefully made and placed, time can be determined with a correctness which will not err five minutes.

In addition to the ordinary horizontal and vertical sun dials, are a great many more complicated designs. One of the sun dials shown in the illustration fires a cannon at noon, and another, which is a memorial sun dial in Washington, D. C., has an erect cross, which, by the length of its shadows at different times of the year, indicates closely the times of the various feast or fast days.

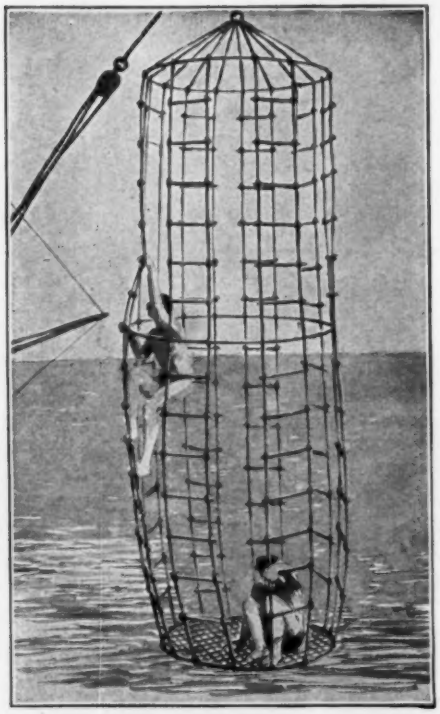


Courtesy Scientific American

The Cannon in the Middle Upper Picture is Fired by the Sun's Rays at High Noon, by Means of a "Burning Glass"

The other illustrations show a dial in Zoological Park, Washington, D. C.; a vertical dial at Bowdoin College, Brunswick, Me., and an imposing public dial on the side of a monument pillar.

The improved life-saving gun, which has been adopted for use on the new United States revenue cutters, "Snohomish" and "Achushnet," has thrown a life-line 1,650 ft. in official tests.



THE GERMAN NAVY RESCUE LADDER

The ships of the German navy are now all equipped with this novel and highly satisfactory rescue ladder. It can be readily lowered over the side at the end of an arm and a large number of men can simultaneously and easily grasp the rungs of the rope ladders and clamber up.

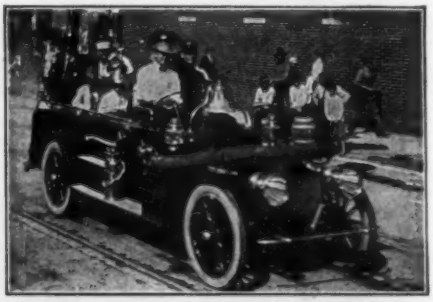
AN AUTOMOBILE FIRE DEPARTMENT

These three up-to-date fire-fighting machines have been installed by the fire department of Joplin, Mo. The gas engine not only drives the fire engine truck, but furnishes the power to drive the pump as well.

The gas engine with which the fire engine is equipped is of the 4-cylinder type and can develop 75 hp. The power can be switched from the drive wheels to the pump by the simple throwing of a lever. The fire engine truck carries 1,000 ft. of hose and a number of 4-gal. chemical tanks as well as the pump.

The chemical automobile is equipped with a 2-cylinder, 25-hp. gas engine, and carries a 60-gal. chemical tank, a reel containing 200 ft. of hose, and two 3-gal. hand chemicals.

The combination hose and ladder trucks, of which the department has two, are driven by 4-cylinder, 50-hp. engines. Each carries 1,000 ft. of hose, two 30-ft. extension ladders, and a number of 6-gal. hand chemicals.—Contributed by Briswaller, Joplin, Mo.



Joplin's Automobile Fire Engine—An Automobile Chemical Wagon—Auto Fire Engine and Ladder Truck in a Mile Race

Grain elevators should never be roofed with shingles.

AUTOMOBILE RUNS WASHING MACHINE

One of the most serious problems of housekeeping at Long Beach, Cal., was recently solved for one woman by harnessing an automobile to a washing machine. An automobile and a washing machine, driven by the mistress of the same house, is not a frequent combination, but it is next to impossible to secure washerwomen in Long Beach.

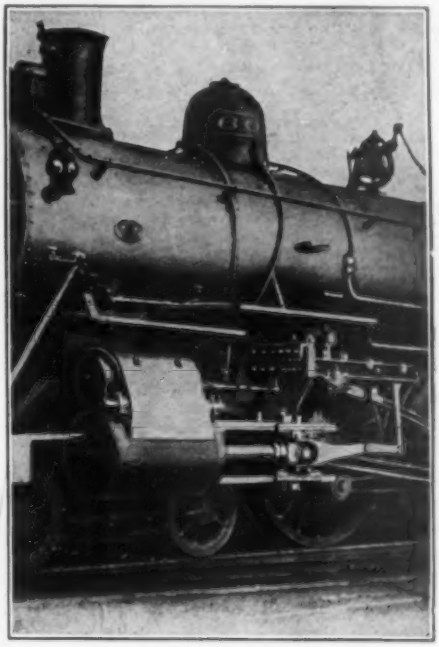
THE OLD AND NEW IN BRIDGE CONSTRUCTION

These illustrations show a curious old bridge in Madison county, Illinois, and the modern concrete bridge that is its successor. The clear span of the new bridge, as was the old, is 42 ft., and the width of the roadway 16 ft. The two illustrations attest the supremacy of reinforced concrete over steel for bridge construction.

Old and New Types of Bridges in Country Districts

IMPROVED GEAR FOR LOCOMOTIVES

This type of gear valve is being placed on many of the new railroad locomotives. The motion of the valve is derived from two independent sources—the main crank by connection



New Locomotive Gear

to the crosshead, and from an eccentric crank at right angles to the main crank. A swinging lever, or radius bar, is suspended from a reversing yoke, movable to any desired angle to impart the required throw and cut-off.

MAKING SHAM JEWELS

Jewelers who have been in business many years often find it difficult to distinguish the difference between real and artificial jewels at first sight, so wonderfully is paste being used. Imitation jewels are now being turned out by the bushel, and can be purchased wholesale at from 20 cents up, according to the kind of gem it is, size not making much difference in the price.

The material used in the manufac-

The Woman's Navy League of Germany has placed these German gunboat models in all the schools of the Empire. They are receptacles for the collection of all the pennies the school children can spare. The fund thus collected is used for philanthropic work among the enlisted men of the navy and their families.

ture of paste jewels is known as "strass," its chief ingredients being potash, oxide of lead, borax, and silica. The quantities of these chemicals vary, according to the variety of stone which is to be imitated, much greater proportions of borax and potash being required for diamonds than for rubies, while for imitation emeralds these ingredients are scarcely needed at all. The utmost care is exercised in making sham jewels, and the grinding, sifting, melting, and other operations are matters of the highest importance.

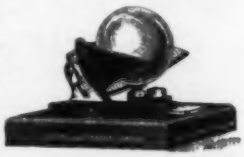
HUMANE SOCIETY HORSE HELPS OTHERS

One of the busiest trucking thoroughfares of Chicago makes a gradual rise when approaching a bridge which crosses the Chicago river, and many teams of truck horses suffer tortures endeavoring to draw their heavy loads up this grade. For this reason the Illinois Humane society has posted a "good Samaritan" horse at that point to aid the teams in making the pull.

"Good Samaritan" Horse

SUNSHINE RECORDER BURNS ITS RECORD

A sunshine recorder that burns a record on a card when the sun is shining is a device recently invented in England. It consists of a metal bowl firmly fixed by means of a brass bracket in a slate base. In front of the bowl is a movable pedestal, upon the curved top of which rests a glass ball. The inside of the bowl is fitted with a series of grooves which hold the strips of card upon which the record is scored.



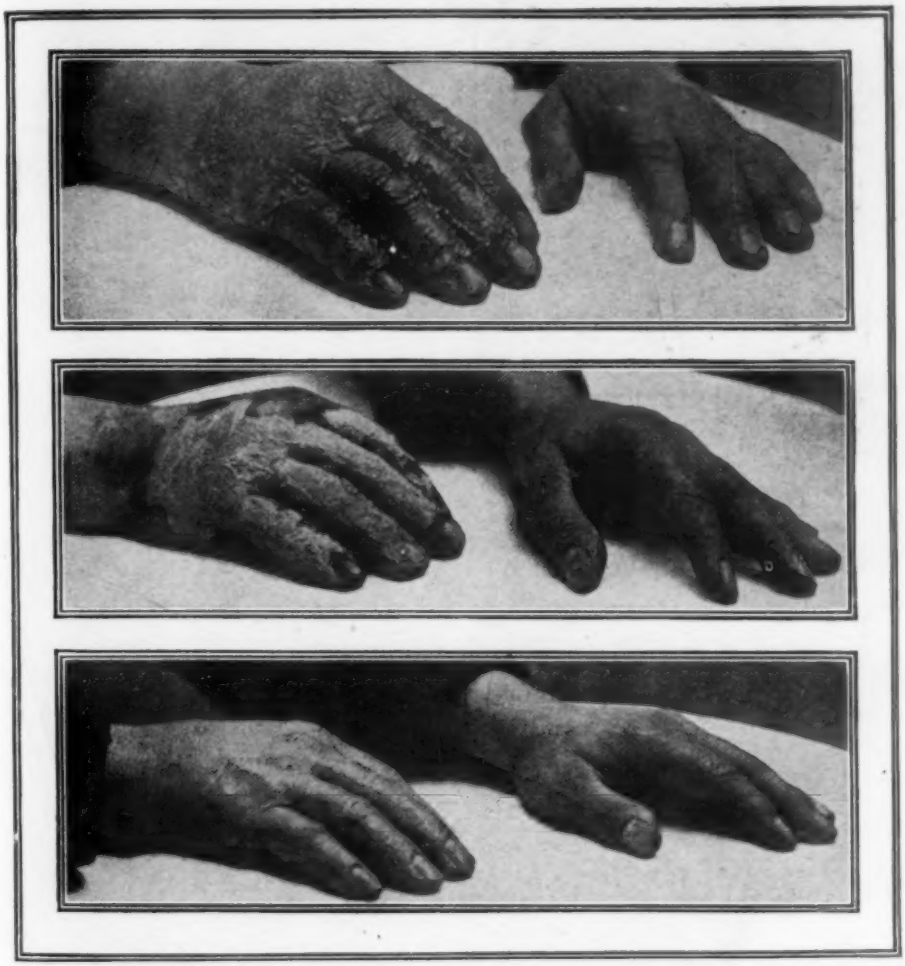
The instrument faces south. When the sun is shining the focussed rays char one of the strips of card, and as it travels across the horizon the burn gradually moves along with it. When the sun is hidden the card is untouched.

Trees and other objects likely to intercept the sun's rays must, of course, be avoided in placing such an instrument.

U. S. "OCTOPUS" MAKES SUBMARINE RECORD

In the recent maneuvers conducted in Buzzard's Bay, the United States submarine "Octopus," established a new record for depth of operations. During one trial the little under-water fighter, with her whole crew aboard, maneuvered for half an hour in a depth of water at no time less than 107 ft. The submarine "Lake," with her crew on board, went down 135 ft. in Narragansett Bay in 1907, but the vessel was not operated at that depth, thus the "Octopus" can claim the record, in the American navy at least, of operating at the greatest depth.

"FIRST AID" FOR ELECTRIC BURNS



1—Condition of Flash Burn Soon After Accident 2—Condition of Same Burn a Few Days After Treatment Commenced 3—Discharged as Cured After 21 Days' Treatment

Electric burns, although intensely painful in many instances, and horrible in appearance, are not particularly bad, if properly cared for. In this connection the first thing to remember is that such burns must be kept perfectly clear of infection. The terrific heat of the burn has, of course, sterilized the burned flesh as no other method possibly could, and if the burned area is infected the patient is caused greater pain at a later period, and in many instances the healing is delayed for weeks and sometimes months. Under no circumstance should the burned area be washed or touched with the hands, and unless sterilized bandages are obtainable, it is best to send the injured person to the doctor without covering the burn. Even freshly laundered handkerchiefs are dangerous. It is also imperative that the blebs, which are blisters filled with a watery substance, be not touched or broken, as their bursting adds to the

Showing Depth of Bad Burn on Hand

pain when the air comes in contact with the raw flesh.

A doctor would much rather have a burn come to him simply bandaged with sterilized gauze than he would to see the blebs all broken and covered with an application of old rancid oil that had lost its power to be of any use.

The majority of electric burns are called flash burns, and are classified as wet and dry burns. These burns are far different from a steam burn or any other kind, the awful heat penetrating so deeply and so quickly that in many instances the area affected is burned to a crisp. Dry burns are very distressing at a later period, but not at the time they are received.

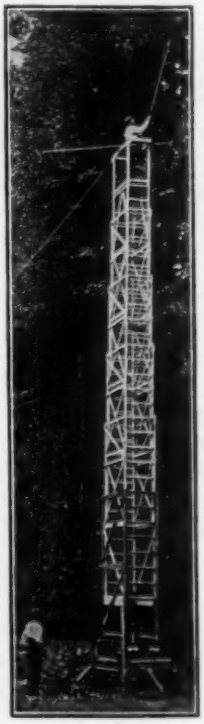
The illustrations are part of those used by Dr. W. W. Sanford, M. D., assistant chief surgeon of the New York Central railway, in a recent lecture, published in Railroad Men's Magazine. The first three photographs show the same burn, the first being taken soon after the accident, the second a few days after the accident, and the third at the end of 21 days, showing a perfectly normal hand, without scars or contractions. The fourth illustration shows a burned hand and arm which took many weeks to cure.

TOP BUGGY BUILT IN LESS THAN THREE HOURS

During a reception at the factory of an Australian buggy company, 2,000 people were entertained by a unique buggy-building demonstration. At seven o'clock in the evening the men set to work with raw material, and for two hours and forty-eight minutes forges roared, machinery whirred and the entire factory hummed with activity. At the end of that time a top-buggy was completed and a horse harnessed in.

CLIPPING A HUGE HEDGE

The wonderful beech hedge shown in this illustration is famous all over the world for its great size. It is about 100 ft. in height and a quarter of a mile long. It was planted in 1745, and is pruned or clipped, every seven or eight years, at a cost of $350. The ladder was made especially for the task. The hedge is on Lord Lansdowne's estate in Perthshire.



LONG-DISTANCE WIRELESS

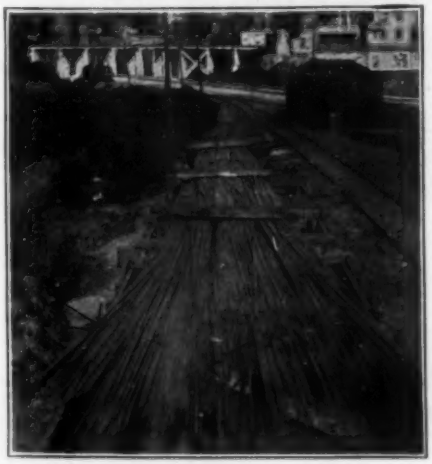
The bureau of equipment of the U. S. Navy is planning a long-distance wireless telegraph station in or near Washington. A tower, or mast, with an elevation of at least 400

A CRANE THAT RUNS ON A ROOF

ft. is to be erected, from which it is hoped to get in touch with vessels 3,000 miles away.

STEEL RODS FOR CONCRETE REINFORCEMENT

Reinforced concrete is rapidly taking the place of all wooden bridges in California. In this illustration is shown a carload of ⅞-in. rods rolled in 70-ft. lengths. In fact, it is a 2-carload, as its excessive length made transportation



Steel Rods 70 Ft. Long

impossible on one car. It is to be used in a concrete bridge to take the place of the wooden one shown in the background of the illustration.

The postoffices in the United States number 61,158.

Many of the warehouses on the docks of the Mersey at Liverpool, Eng., have hydraulic or electric transporter cranes on their roofs. The one shown in the illustration has a capacity of 3,000 lb. and is used for lifting merchandise from the holds of vessels. It runs upon two tracks, one of which runs along the ridge of the roof and the other along the eaves. It is sufficiently counterbalanced to carry the load above mentioned.

SLEEPING CARS FOR COWBOYS

An ordinary caboose is the usual accommodation furnished by the railroads to carry the cowboys who accompany the shipments of cattle from the west to such packing centers as Chicago and Omaha, but precedent has at last been shattered by one of the western railroad systems. The result is the specially designed sleeping car shown in this illustration.

A Cattle Train's Parlor Car

HIGHEST VOLTAGE TRANSFORMER EVER BUILT

Up to within a short time ago the highest voltage transformers regularly built for the transmission of electric power seldom exceeded 60,000 to 70,000 volts, with a few isolated cases of operation at 80,000 volts. Within the past year, however, many large, shell-type transformers, having a high tension voltage of 100,000 and over, have been built and placed in operation.

Courtesy General Electric Review

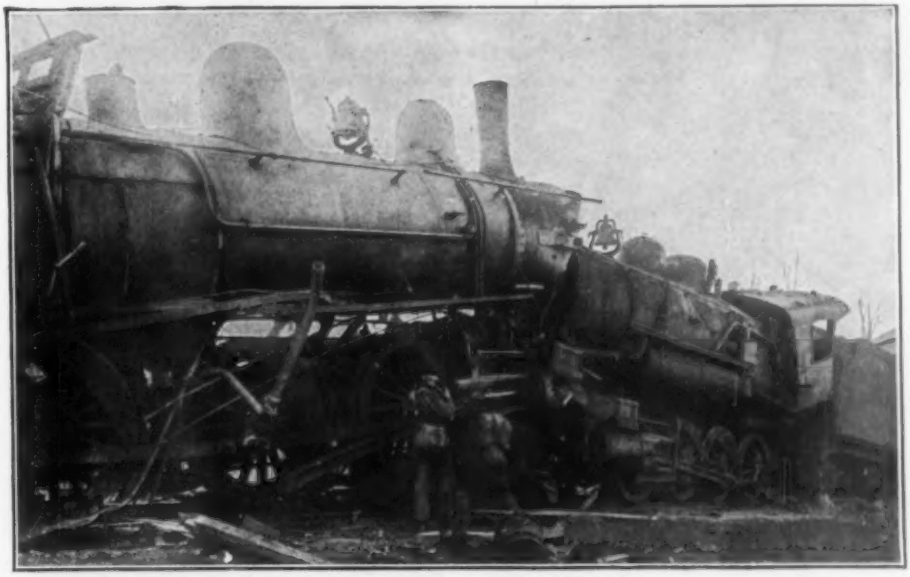
Weight 60 Tons—Transforms 100,000 Volts

This illustration shows the largest transformer ever built. It is wound for 100,000 volts, the highest voltage ever employed commercially. Its net weight, without oil, is about 120,000 lb. The oil required is about 7,500 gal.

Texas property has been assessed at $2,200,000,000, an increase of $600,000,000 over last year.

The railroads of the United States annually consume 100,000,000 tons of coal.

COLLISION MAKES KINDLING WOOD OF CARS



Wrecked Engines in Freight Train Collision—A Few of the 18 Cars Demolished

These illustrations give a comprehensive idea of the devastation caused in two lines of freight cars by a head-on collision between two freight trains on the Ann Arbor railroad. The wreck occurred near Lakewood, Mich., killing one of the engineers and both firemen. The cars demolished numbered 18.

Millions of dollars will be spent in Germany on canals within the next few years.

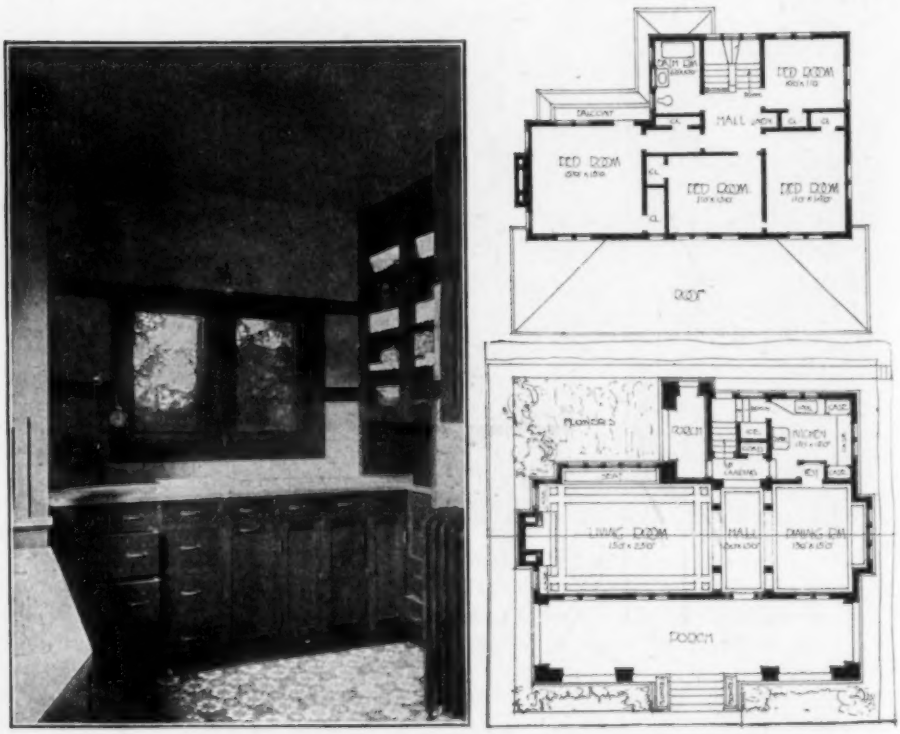
A MODERN HOUSE FOR $5,500

The cost of this modern and artistically arranged house was $5,500, complete, including lighting, plumbing, heating, and a number of extras of which the terracing of the lot on which it stands was not a small item. It is in Oak Park, one of the many suburbs of Chicago, and draws considerable attention.

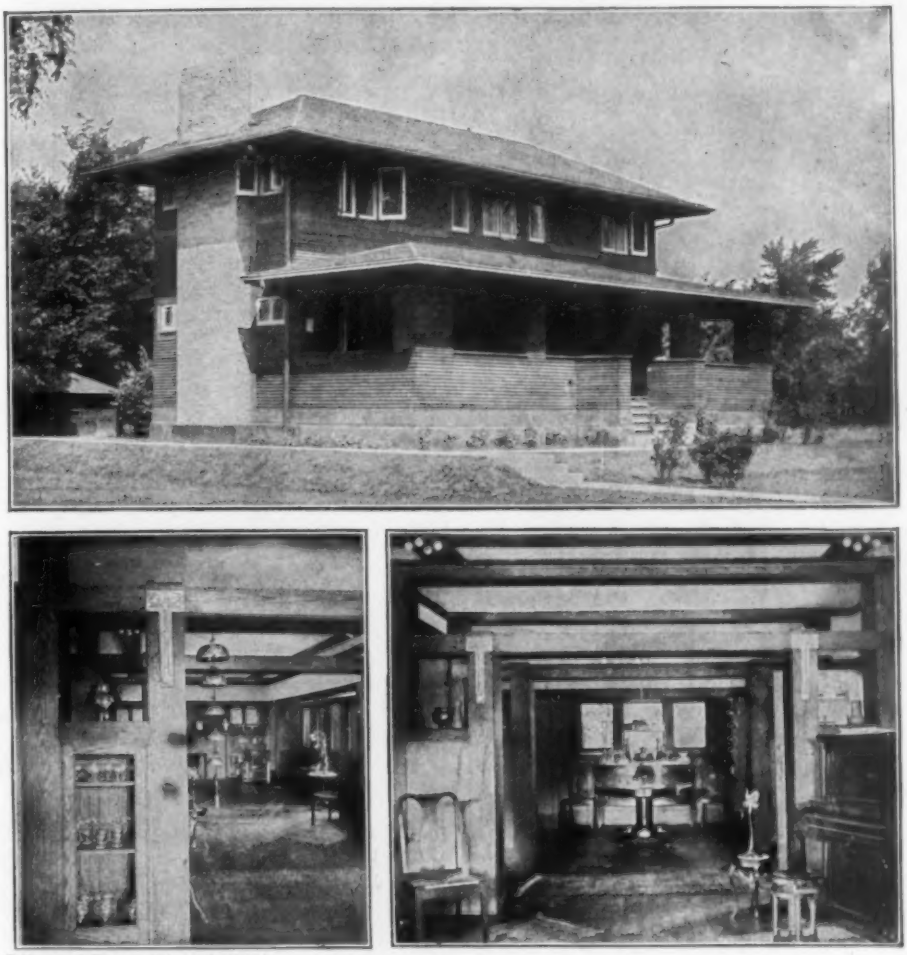
From a front view the porch is the most notable feature. A deep porch is a great asset to any house in summer, but on many houses such a porch as this would darken the first-floor rooms to a disagreeable extent. A glance at the ground floor plan of this house, however, will show that the architects took this drawback of the usual deep porch into consideration and eliminated it. There is only one living room, a large dining room, a hall, and a kitchen on the first floor, but when a room is as large as the first no more are required.

The living room is 23 ft. long and 15 ft. wide, and has windows on three sides, thus providing sufficient light regardless of the deep porch. Along one side is a long window seat. The hallway is 8 ft. wide by 15 ft. long, and the dining room is 13 ft. wide by 15 ft. long. One of the illustrations gives a comprehensive view of the living room, looking across the hall from the entrance of the dining room, and another shows the dining room. The heavy oak ceiling and wall beams added materially to the cost of the house, also to the artistic appearance of the interior.

The kitchen is only 10 by 12 ft., but it is compact and as full of surprises as the buffet of a railway dining car, having a place for everything, which is a great convenience when everything is in its place. Around the sides of the kitchen are three glass-doored cases for china, innumerable drawers and recep-



First and Second Floor Plans of House and Buffet Kitchen



Tallmadge & Watson, Chicago, Architects.

Views of the Exterior and Interior of $5,500 House

tacles for food stuffs, and closets for coats, and an ice box. One of the cases opens into the dining room as well as the kitchen and can be used to pass things through.

On the second floor are four bedrooms, one of which is 15 by 15 ft., and two of which are 11 by 15 ft. A bathroom, 6 by 10 ft., a hall, and a balcony complete the second floor plan.

GUIDING SUBMARINES FROM THE SHORE

The latest experiments carried out by the French naval officers in submarine navigation have brought to light a method of guiding submarines from the shore by Herzian waves and sound waves. If a Herzian wave and a sound wave leave the submerged vessel at the same time the Herzian wave will reach the shore receiver first, and then by watching for and noting the time of the arrival of the sound wave, the distance which intervenes between the vessel and the receiver can be calculated and her locality determined. Once determined, a quick interchange of messages between

vessel and receiver enables an observer on the surface to guide the submarine below.

DETACHED ELECTRIC PIANO-PLAYER

This electrical piano-player plays the instrument from a distance. The mechanism is contained in an invisible case, and is the only part of the piano-player

Operating the Piano-Player

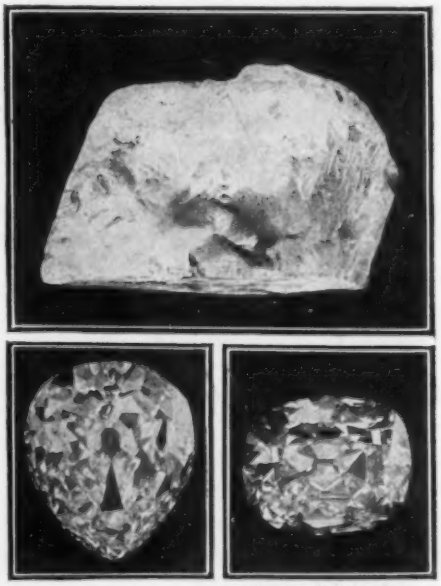
directly attached to the piano. The transmitter or actuating mechanism is contained in a small case which may be placed on a convenient stand or table. The case is connected to the piano by flexible wires.

The person playing the instrument simply takes hold of the two knobs shown in the illustration. The knob held by the left hand controls the speed of the music roll, and by the slightest turn to the left or right the time is altered. The knob held by the right hand controls the force of the electric current which acts upon the piano keys, thus commanding every gradation of tone by simply turning the wrist. In the center of this knob is a small push-button similar to an electric bell button. By pressing this, electric power is brought to bear upon the soft pedal, resulting the same as the pressure of the pianist's foot. A push-button in the center of the left-hand knob exercises pressure on the sustaining pedal of the piano.

LARGEST DIAMONDS IN EXISTENCE

The "Culinan," the great diamond presented to King Edward of England by the Transvaal Government, weighed 3,025¾ carats in its rough state, as compared with the 971 carats of the famous "Excelsior." Its length was about 4½ in., its height 2½ in. and its breadth 2½ in.

The first task in the cutting and polishing of the great diamond was to divide the stone into two. After an incision a quarter of an inch deep had been made in the surface of the stone to receive the knife, the blows were struck that split it in two. The cutting knife, which was a comb-shaped piece of steel, was struck with a heavy steel rod, wielded with all the power of a strong man. The knife broke under the first blow, but the second was successful.



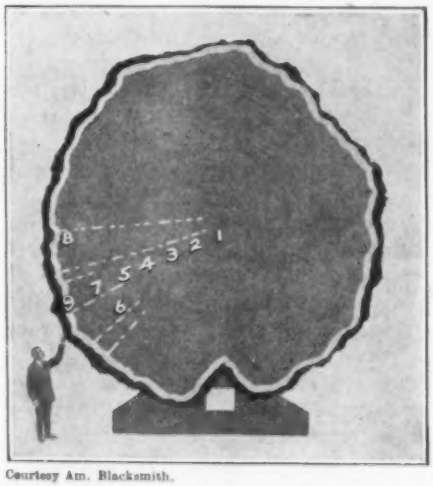
London Illustrated News

Before and After Cutting

The two big diamonds thus yielded by the Culinan, and the stone in the rough are shown in the illustrations. The finished diamonds are by far the largest in existence, the larger weighing 516½ carats, and the smaller 309 3-16 carats.

A TREE 1,350 YEARS OLD

A count of the annular rings in this tree shows that it began to grow in 550 A. D., 1,358 years ago. It was a gigantic redwood tree, and when recently felled to earth had reached a height of



Courtesy Am. Blacksmith.

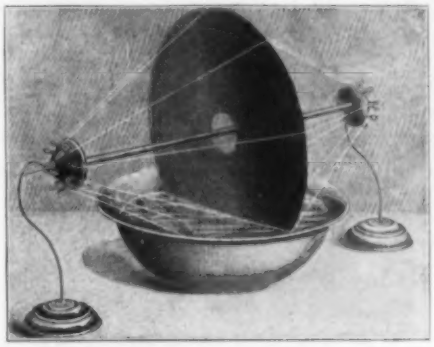
This Tree Started to Grow in 550 A. D.

350 ft. and a circumference of 90 ft. at the base.

PERPETUAL MOTION OF A KIND

This device, with its perpetual motion principle, is simply an object of curiosity not possible for serious application, simply demonstrating certain physical influences. It is the invention of a French scientist.

The device consists of a disc of any material of homogeneous nature, such as ebonite, zinc, glass, etc., with a hole of considerable size through its center to accommodate an axis of wood or iron, no part of which it touches. The disc is maintained in a perpendicular position with the axis by 12 or 15 strings of hemp, as shown in the illustration. The ends of the axis, or axle, pivot upon pointed spindles, thus diminishing the friction as much as possible. The lower part of the disc is submerged in a basin containing water, and it is the absorption of this water by the disc that keeps it slowly turning indefinitely, or, at least, as long as there is water present. The disc completes a revolution once in every 10 or 12 minutes.



Almost Perpetual Motion

HOUSE SAWED IN TWO BY RAILROAD COMPANY

A railroad company with lines running through Waterbury, Conn., wrecked this house as shown in the illustration, because the rear end of it was resting on ground contained in the railroad right-of-way. The owner of the

The Undesirable House

house refused to move it and the railroad sent a gang of men to cut away the part infringing on its property. The owner and his family remained in the house while the operation was being performed, but later moved out and commenced suit.

A COLOR MEASURING INSTRUMENT

Standards of color are by no means as easily established and maintained as are those for distance, weight, strength,

This Machine Tells the Proportions of a Color

etc. The latter are tangible, and, under similar conditions, permanent. But color once established by means of a sample is subject to change by time and exposure, and the mixing of certain proportions of specified color ingredients does not insure absolute similarity of result, because of the uncontrollable variation in the elements which make up the mixture.

An instrument that will measure color and keep records of the same so that it can be reproduced at any time is therefore of considerable value. The device shown in the illustration was designed for this purpose. It is a rectangular box, some 18 in. long, containing three apertures covered by primary color screens of red, green, and blue glass. Each of these apertures is provided with an adjustable shutter, the size of the opening of which, and hence the proportion of the given color, can be read upon a corresponding scale.

At the other end of the box is an eye piece, in the middle a lens and a wedge prism, so located that the light from the color screens passes through only one-half of the lens. At this point is also located a mixing wheel consisting of a dozen convex prisms so arranged around its rim that they successively pass through the line of vision as the wheel is revolved. When at rest, either red, green, or blue will appear according to the position of the lens, but when the wheel is revolved at the proper rate of speed, the independent colors become so perfectly mixed as to give a single color. The character of this color may be changed through all the hues of the rainbow by varying the openings of the shutters. The color which is to be matched can be seen through the other half of the lens, and when the colors shown in both halves are the same, the size of the openings of the three shutters show the proportions of red, green, and blue that will produce it. Thus a certain shade of purple, for instance, will be shown as Red 50, Green 5, and Blue 80.

Records may be kept of each opening as read on the scale, and the color can be reproduced at any time by simply resetting the same scale readings.

ACCIDENTAL FIRE TEST OF CONCRETE HOUSE

Many fire tests of concrete construction have been made in different parts of the United States, but, in all probability, none of them were more interesting than the unpremeditated fire test of a concrete house during a recent fire at Winthrop Beach, a suburb of Boston.

Two large hotels of frame construction and seven frame houses were destroyed by the fire, the heat of which was so intense that nothing remained of the frame buildings two hours after the fire started but smouldering ruins. The concrete house in question was under construction immediately adjacent

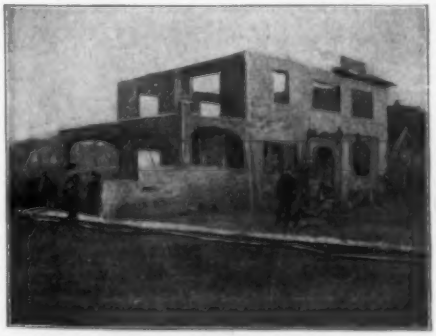
Courtesy Cement Age.
Taken by Light of Fire

to one of the burned hotels, a distance of only 80 ft. intervening. The first photograph, taken an hour after the fire started, shows the incomplete condition of the house and its appearance as the fire within broke through the partially completed roof. The interior construction was of lumber, and the roof was covered with 1-in. boards, upon which was to be constructed a light concrete covering, reinforced with expanded metal. Considerable lumber in the cellar added fuel to the flames. The photograph was taken by the light of the burning buildings.

The second photograph shows the appearance of the house after the fire. As evidence of the intensity of the heat, the granite curbstones on the opposite side of the street were so crumbled that they had to be relaid.

An inspection of the concrete walls three weeks after the fire showed that the strength of the concrete had not been impaired, and that only the plastering on the side of the building immediately adjacent to the hotel had been injured.

The walls were of monolithic construction, the first story being 10 in. thick, with an air space 3 in. wide, and the second story 8 in. thick, with a 2-in. air space.



Concrete House After the Fire

INGENIOUS MAIL DELIVERY

Rather than travel a couple of miles after their mail, the residents of Beacon Hill, a suburb of Seattle, Wash., have adopted this scheme to post and receive letters. Half a hundred families live just beyond the end of the city delivery, but each of them has nailed some kind of a mail box to the sides of this old tool house, and the mail man deposits their mail there every day.

A Suburban Postoffice

An underground railway is proposed for Buenos Ayres which will connect the Western Railway with the center of the city.

Copyright by Underwood & Underwood, N. Y.

Printing and Trimming United States Money

WHERE MONEY IS QUICKLY MADE

Money holds a great fascination for everybody, not only in spending or saving it, but also in the making of it. These illustrations are entitled "Filling Rush Orders for Money" and depict three of the scenes at the U. S. treasury when the demand for paper money is great.

The first of the illustrations shows the money being run through the machine that numbers it. In the second the money is being counted by several expert counters in the Bureau of Engraving and Printing before being sent to the treasury, where it is again counted. The third illustration shows the trimming machine. This trims the margins so accurately that the seal always falls in the same place.

ENGLAND ADVISED TO BUILD AIR-SHIPS

England's inactivity, or at least its slow progress in aerial navigation, has been arraigned by Sir Hiram Maxim, the famous inventor of implements of war. In a speech before the English Society of Arts he says:

"While we are doubting, Germany, France and the United States are believing. England is far behind, and in case of war with continental powers, flying-machines

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Counting and Recounting the New Money

will be used to bombard English towns on coast and inland. Within a year's time the art of aerial navigation will be so far advanced that London can be attacked from overhead at night without our enemy needing to fear our boasted fleet of battleships."

A factory in Amsterdam cuts 400,000 diamonds annually.

THE COLUMBUS, O., WATER STORAGE DAM

Had it not been for this storage dam, which supplies the drinking water for Columbus, Ohio, its residents would have had little or no water during the siege of dry weather last summer and fall. The length of the dam is 500 ft., the height of its crest 33 ft., and the

High Water Going Over Columbus Dam

amount of water it holds in storage under average conditions is 1,600,000,000 gallons.

A NEW SANITARY DRINKING FOUNTAIN

Furnishes a New Cup with Each Drink

Health authorities throughout the country are heralding with a great deal of enthusiasm the advent of a new sanitary drinking fountain, and are looking forward to the time when this new health dispensing machine will be installed in all of our public schools, waiting rooms, factories, theatres, etc.

Water Vending Machine

A public spirited man in Boston has invented a very unique, simple, and practical piece of mechanism in the shape of a sanitary drinking fountain. It is the only apparatus that delivers water and containers from separate receptacles by one and the same process, and the interest which this invention is arousing is helping considerably in the national crusade against the spread of contagious disease through the medium of the public drinking cup.

This fountain delivers for the sum of one penny, a new clean paper cup filled with pure water. The cup is made of water-proofed paper or fiber, and can not be returned to the machine, thus insuring to every purchaser an absolutely clean cup.

The method of operating this sanitary water vendor is very simple. The cup and water are delivered at one operation. The purchaser deposits one penny in the slot provided therefor, throws the lever to the right as far as it will go and continues holding it until the paper cup drops into view and is automatically filled with water.

The fountain has a very neat, clean and sanitary appearance, being made for the most part of white enamel. The paper cups are stored upside down in the long nickel-plated tube just above the vendor, thus keeping them free from all dust, and therefore germless. The ice used in cooling the water does not come in contact with it at any time, thus preventing any chance of infection from such a source.

A water vendor of this design has recently been installed in the office of the Commissioner of Health of New York City, and the International Tuberculosis Society have determined to use it as one of their chief weapons in their battle against the extermination of the Great White Plague.

TWO ENORMOUS LOAVES OF BREAD

It has always been a habit of bakers as far back as the chronicles of the profession go, and that means hun-

Courtesy Bakers Helper
Loaves Are 8 Ft. 6 In. Long

dreds of years, to turn out loaves of bread or other productions of their skill in extraordinary shapes and sizes, as a means of drawing attention. The public has never grown tired of this kind of advertising, and it generally repays the baker.

These huge loaves of bread were made recently by a North Dakota baker on the occasion of a harvest festival. Each loaf measured 8 ft. 6 in. in length, and weighed 135 and 145 lb. respectively.

MINERAL PRODUCTION AND AGRICULTURE

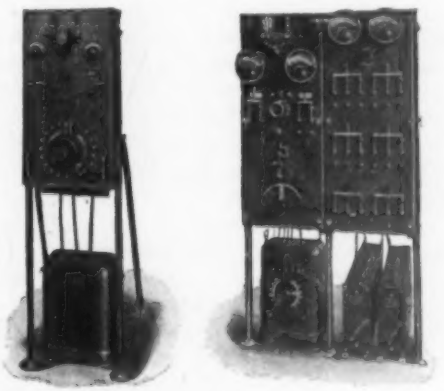
The new volume on the mineral resources of the United States, published by the Geological Survey, shows a remarkable increase in the value of the mineral production of the country since the beginning of the new century. This increase includes all the principal mineral products, representing an annual output of more than $2,000,000,000, which is an advance of more than 100 per cent in the last 10 years.

The farm products of the country have increased almost as rapidly, the products of 1908 being estimated at 65 per cent in advance of 1899, which, taking 100 as the basis for the value of the production in 1899, is an advance of more than one-half.

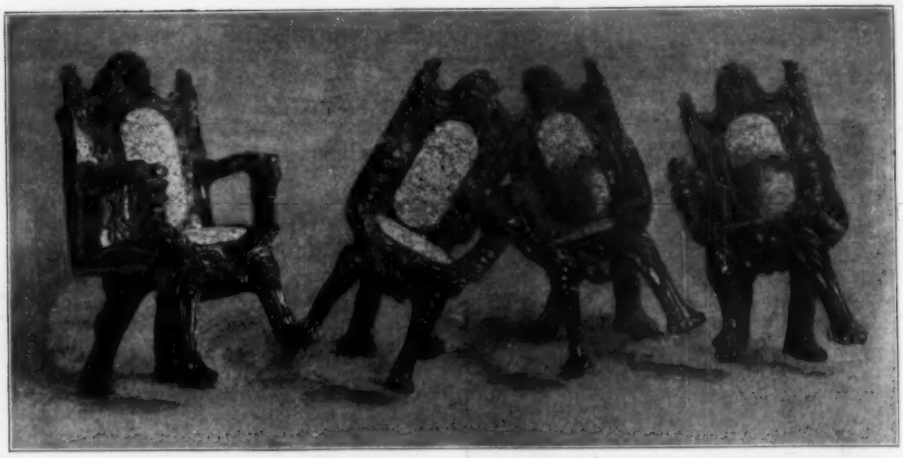
ELECTRIC AUTO CHARGING APPARATUS

The growing use of electric automobiles has resulted in a demand for some means of conveniently charging the batteries in the private garages of the owners of the machines. The required current and voltage cannot usually be obtained from central station distribution circuits without converting apparatus, but batteries may be charged from an alternating current line by means of arc rectifiers and motor-generator sets. If a direct low voltage current is available, charging may be accomplished by the use of a charging rheostat.

The charging panels shown in these illustrations possess all the necessary apparatus for battery charging and are easily installed in private garages, as they need no special foundation. The mercury arc rectifier comprises the rectifying apparatus, the instruments for indicating the current flowing through the battery, a voltmeter for reading the voltage of the battery before and during charging, and current adjusting devices.



Charging Panel and Mercury Arc Rectifier for Private Garage



Ballet Composed of Dancing Furniture

CHAIRS THAT DANCE

The dancing chairs shown in this illustration compose one of the most curious ballets ever staged. The back legs of the chairs are formed by the legs of the dancers, and the result is dancing furniture. It is part of a light opera recently staged in Chicago and New York.

WHALEBACKS AS WRECKING PONTOONS

In the task of again raising the U. S. cruiser "Yankee," the wrecking company plans to use two whaleback barges as pontoons. These vessels will be anchored beside the "Yankee," one on either side, and water will be pumped into them until they barely float. They will then be chained to the cruiser and the water pumped out.

This plan is expected to give the barges a tremendous lifting power, sufficient at least to raise the sunken ship a few feet, which will be sufficient to allow some of the compartments of the "Yankee" to be pumped out and the air compressors started.

It is proposed to establish a professorship of aviation at Gœttinge university in Berlin.

CONCRETE TOMBSTONES

An interesting example of the versatility of concrete is shown by this illustration of a concrete tombstone made by a 16-year-old boy in Accomac County, Virginia. It is also interesting to note that the tombstone marks the grave of the Rev. Griffith Callahan, a minister of the Methodist church who conducted the first meeting of that denomination north of the Ohio river.

Courtesy Cement Age

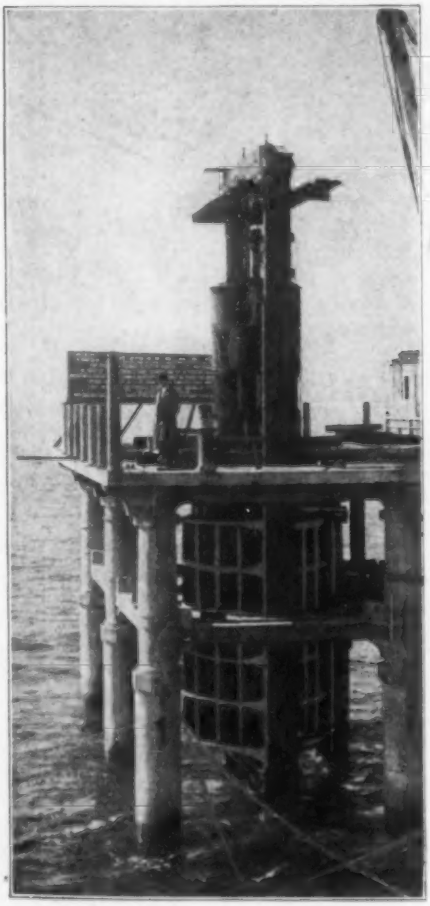
Concrete Tombstone Made by 16-Year-Old Boy

The stone is 5 ft. high and stands on a 12-in. pedestal. Two slabs of marble, one on the top and the other in the front, held in place by iron hooks and rods imbedded in the concrete, bear the inscriptions.

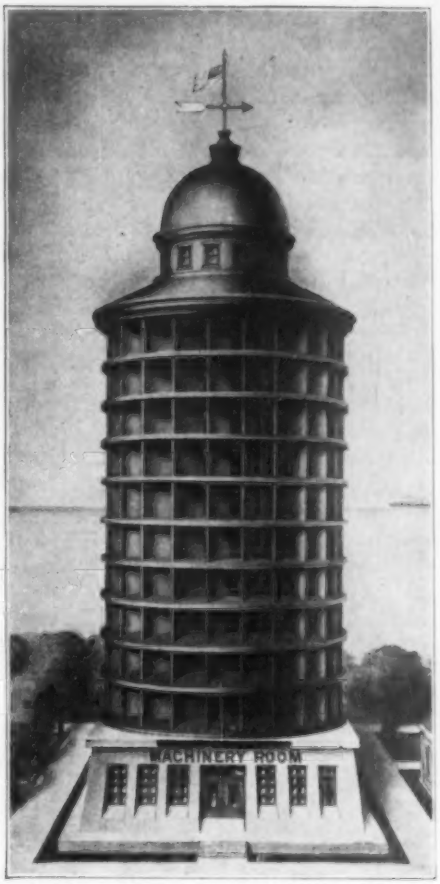
A TURBINE HARNESSED TO OCEAN WAVES

A wave motor, the revolving portion of which resembles a turbine in construction and effect, has been installed at the end of a 1,150-ft. pier at Atlantic City to generate electricity for the light and power used upon the pier.

The motor is claimed to be the first practical commercial application of the irregular but powerful motion of the ocean for the development of electrical power. The motors, of which there are two, rest on a sea floor 12 ft. under the water. On top of the motors is an intermediate concrete floor, weighing 60 tons, above that a concrete floor weighing 106 tons, and then still another floor weighing 60 tons. The whole is supported on nine concrete piles, reinforced with steel rails and bars. The piling and floors make the structure a rigid mass of concrete and steel, weighing several hundred tons.



Installing the Wave Motor



Proposed 100-Ft. Windmill

Each motor weighs 61 tons, and they will furnish the economical power necessary to generate electricity for the lighting and other utilities connected with the immense pier.

The motors consist of upright, cylin-

drical wheels, equipped with vertical parallel blades revolving within a stationary shield. The outside wheel, or shield, consists of a series of deflectors, or guide blades, set at such angles as to harmonize all outside conflicting forces of water as they are jetted into the interior of the wheel. The inside, or revolving wheel, is equipped with specially devised vanes. These vanes are constructed of curved blades against which, almost midway, are set straight blades at right angles. This arrangement is claimed to give the motor an efficiency of 80 per cent of all the water passing through the wheel.

The inventor of the motor claims that the same principle can be applied to a windmill. One of the illustrations, which is an imaginary sketch of the wave motor used as a windmill, gives a clearer idea of the device than the illustration showing it in position at the end of the pier.

HOW TO MAKE A ROMAN CHAIR

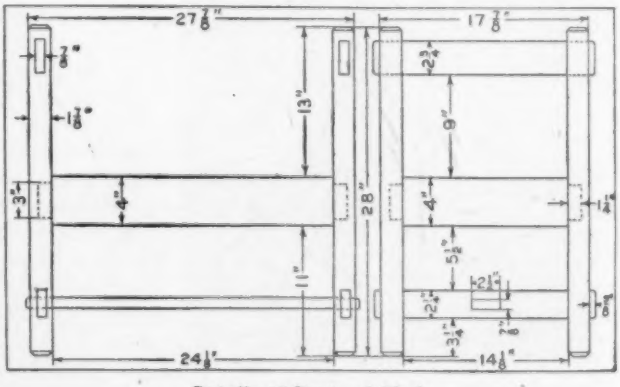
In making this roman chair, as well as other articles of mission furniture, the materials can be ordered from the mill with much of the hard work completed. Order the stock to make this chair as follows:

4 posts, 1⅞ by 1⅞ by 30 in.
2 top rails, ⅞ by 2¾ by 20 in.
2 bottom rails, ⅞ by 2¼ by 20 in.
2 rails, ⅞ by 4 by 16 in.
2 side rails, ⅞ by 4 by 28 in.
1 stretcher, ⅞ by 3 by 30 in.

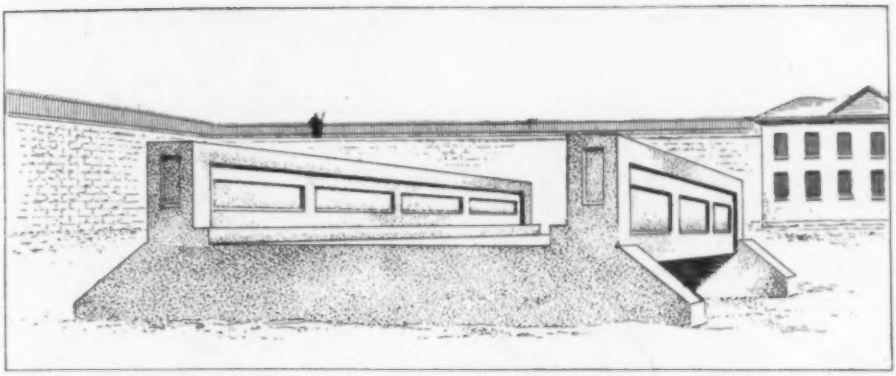
The Roman Chair

Have all these pieces mill planed on the four sides straight and square, also have them sandpapered on the four sides of each. Plain sawed white or red oak finishes nicely and is easily obtained. The sizes are specified exact as to thickness and width, but the lengths are longer than is needed. This is to allow for cutting and fitting.

Begin by squaring one end of each post; measure the length 28 in. and, placing all of them side by side, square a line across the four, saw, then plane these ends square. The top and bottom side rails are treated in a similar manner, their length being 19⅛ in. each. These pieces extend right through the posts projecting ⅝ in. beyond the surface. The mortises in the posts must be cut smoothly and of exact size. Wood pins fasten these rails and posts together. The other rails have tenons ½ by 3 in. shouldered on the two edges and one side. The mortise in the post is placed central. On the ends of the chair the shouldered side is turned in (see photograph), while on the front



Details of Parts of Chair



EXPERIMENTAL CONCRETE BRIDGE BUILT BY CONVICTS

What is perhaps the largest reinforced concrete bridge test at present under way in this country has been made possible through the coöperation of the authorities of the Southern Illinois Penitentiary at Menard, the work being done by convict labor. The bridge was built in the prison yard on an old quarry floor, the rock being below the surface of the ground. The clear span of the bridge is 40 ft., and the width of the roadway 18 ft.

One of the most interesting features about the test is the fact that convicts have been employed to build the bridge, which is, perhaps, the first instance where convict labor has been used for the purpose of scientific investigation. Another feature is the fact that the bridge is to be tested to destruction. The test includes the loading of the bridge with a preliminary load equal to the full amount that the structure is designed to carry, allowing it to remain for a number of days, while the deflections in the floor and girders will be noted, and then the gradual addition of more weight until the bridge collapses.

The object in making the test is to watch the behavior of the bridge under the applications of loads far in excess of the weight it would ordinarily have to uphold, and to gain a knowledge of the strength of the structure as a whole, which can be done in no other way than by actual test.

and back they are turned out. Miter the ends of these tenons. These tenons are to be glued and clamped—the ends of the chair being put together first. When this is dry the sides are clamped. The stretcher should have its ends shouldered on the two edges so as to make a 2½-in. tenon. Allow the tenons to extend 1⅛ in. beyond the cross rail and cut mortises in these tenons for the keys.

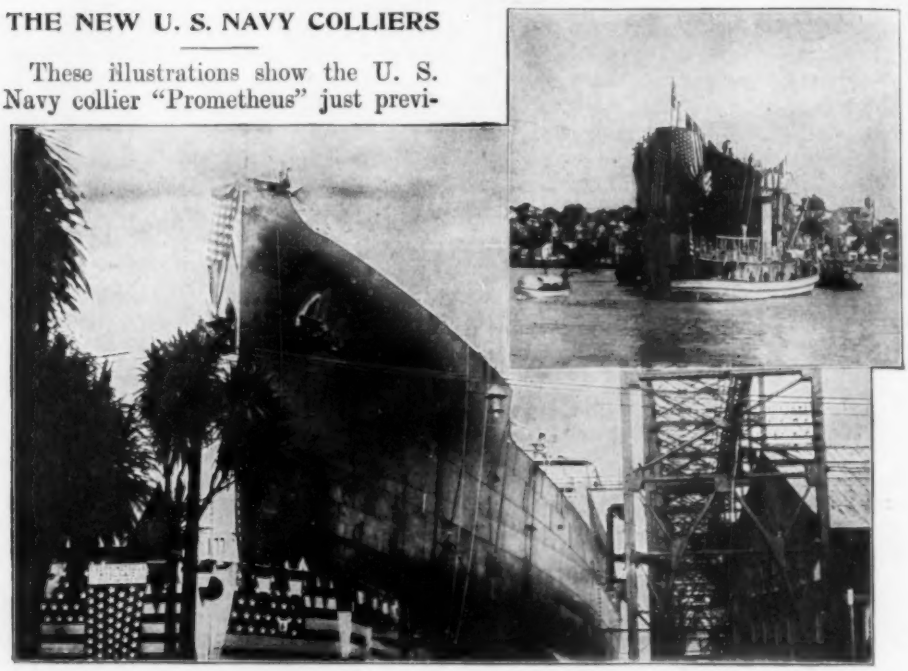
All projecting tenons, as well as the tops and bottoms of the posts, should be chamfered about ⅛ in. For the seat, screw cleats to the insides of the rails and place a platform of thin boards so that its top surface is ½ in. below the top of the rails.

A cushion can be made, as shown in the photograph, by lacing with leather thongs two pieces of Spanish leather cut to proper length and width. When nearly laced fill with any of the common upholsterer's fillings.

For a brown stain, dissolve by boiling in 4 oz. of water, extract of logwood the size of a walnut. Apply hot and repeat until the desired color is obtained. Stains can be bought ready prepared, however, and are quite satisfactory. Finish by applying several coats of wax.

THE NEW U. S. NAVY COLLIERS

These illustrations show the U. S. Navy collier "Prometheus" just previous to and just after its launching at the Mare Island Navy Yard, California, in December. The keel was laid in October, 1907, and one of the features of her building lies in the fact that when launched she was 90 per cent completed. The "Prometheus" is one of the new type of colliers, having a length of 450 ft., and a displacement of 12,500 tons. She carries a main battery of four 6-lb. guns.



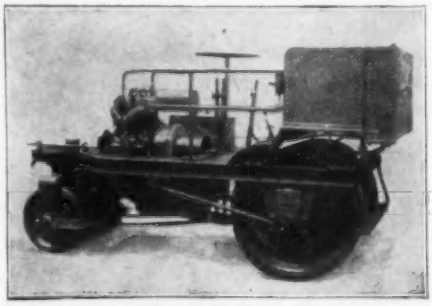
The Launching of the U. S. Collier "Prometheus"

ENGLISH MOTOR-ROLLER BALLASTED WITH WATER

The accompanying illustration shows the construction and method of operation of an ingenious motor-roller, ballasted with water. It is manufactured at Petersburg, England, and is used in road-making of all kinds, and for rolling golf links and similar tasks.

The machine, which weighs 6 tons when its ballast tank is full, is driven by a 14-hp., double cylinder gas engine. The rear roller is 4½ ft. wide, 3 ft. in diameter, and weighs 4 tons.

In addition to the water-ballast tank is a smaller tank which contains water for keeping the surface of the rollers clear when tar-macadam or asphalt is being rolled. Pipes run from this tank to each of the rollers and keep them well sprinkled.



Machine Weighs 6 Tons

The fires in the United States each year cost more than the maintenance of the German army.

The British battleship "Bellerophon" showed a speed of 25¼ miles an hour in recent trial tests.

EDITORIAL

Progress along mechanical lines is meteoric. At irregular intervals some great idea will flash across the sky and for a few weeks the world is surprised and astounded. Then its significance slowly fades away and the event gradually recedes until finally what was a seven-days' wonder becomes at last so commonplace as to excite no comment. As time goes on new generations are born to know the electric light, and telephone, and X-rays, wireless telegraph and wireless telephone as every-day utilities. They cannot understand how crowds looked almost with awe on the first arc lights, and traveled miles to say they had actually seen with their own eyes midnight made as bright as noonday and a lamp which burned without wick or oil, nor required a match.

As each really great invention springs into being we flatter ourselves we live in a day from which one looks backward on the big things nearly all accomplished. We proudly stand upon the summit, with no such heights beyond. The peoples in the days to come surely cannot witness any such advance as we have seen and known. We forget our grandfathers rode in the first street cars; that our own fathers chased the first steam fire engine.

Out on the farms and away back in the hills this very moment are chubby faced, red-haired boys who will be the Edisons of 1940. No one dreams of the things they are destined to do, or the unheard of spots that are to become famous as the birthplace of noted inventors and engineers.

As great mysteries in mechanics are ahead as any that have yet transpired, and doubtless even greater, for each year adds to the fund of knowledge. One small shelf of books costing a few dollars contains results which cost several hundred years of experiment and research.

With such a start what cannot our coming inventors accomplish?

* * *

The past year has not been one characterized by any great epoch-marking event in mechanics save one. This year man has for the first time really sailed the air without the help of a lifting gas. Whether or not the aeroplane shall prove the solution of aerial navigation is too early to determine. Great, very great advances, have been made, but we are yet upon the threshold only. The door opens. Whether it leads to the star chamber or only into the court yard time alone will tell.

There has been in 1908 much progress along many mechanical lines of far greater practical value than that of aviation. Things that really make for the safety and comfort and employment of the human race. The scope of many materials has been enlarged; improvements have been made in machines and processes, but in mechanics no historic peg has been driven in the wall of time as would answer to hang a Davy's safety lamp upon.

* * *

By a process of elimination the deadly art of war may finally be reduced to a refined and gentlemanly exchange of courtesies. As fast as inventors work out some unusually deadly contrivance, efforts are made to have its use stricken from the list of

respectable fighting. This is not saying the program is not an acceptable one to the ordinary citizen, even though somewhat discouraging to the inventor whose ideas have cost many sleepless nights and much brain-fag.

For instance, just as the aviators and aeronauts after innumerable dangers and not a few accidents are about ready to guarantee the delivery of explosives from lofty heights, at all hours of the day or night, the Hague committee get busy with resolutions which are calculated to spoil the sport. Imagine the satisfaction one of these aerial gunners would experience in relating how from a height of 5,000 feet he landed a ringer in the shape of a bomb on the tip of a church spire, like a pumpkin on a picket fence.

What with submarines to blow battleships up from below, and airships to send them to the bottom from above, it would seem as if the vein were about worked out, and the opportunities for invention were rapidly diminishing.

However, we still have hope in perfecting an electric catapult which will hurl a bolt of 500,000 volts via wireless across a thousand miles of sea and hit the mark nine shots out of ten.

After that an artificial earthquake would be useful in demolishing the fortifications of an enemy at long range. It might also be a good idea to work out a mechanical soldier in blocks of ten abreast for storming defenses, and controlled by wires or wireless to fire at just the right moment when the operator from a safe distance pushed the button.

Things once far less probable are now accomplished facts. Why not these ?

* * *

"Conservation of Energy" is a much mentioned subject these days and more people than do might practice it with profit. These lines are written a few days before Christmas and are suggested by the following:

A friend and myself were passing a store in front of which was a small forest of Christmas trees. "Awful, isn't it," he remarked. "It makes me feel sad notwithstanding the pleasure the little folks get out of them." And then he waxed really eloquent in his earnest denunciation of the crime of "denuding the forests" from earliest days of "clearing and burning" down to the present group of stubby pines on a city sidewalk.

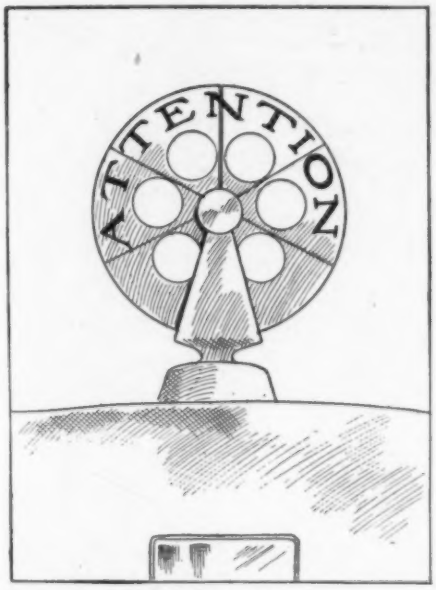
When he had finished saving the country, I remarked: "Cheer up! All is not lost. I, too, used to lament as you do now, but last summer when in Northern Michigan I was disillusioned. These promising monarchs of the forest are nothing but second growth 'scrubs' which under the most favorable circumstances would never reach a height of more than ten or fifteen feet with a stem too small even for fence posts. An old lumberman drove me for several miles over land he had cut over fully twenty years ago now covered with thousands of these scrubs. All efforts to grow anything larger had utterly failed."

"I hope it's so," he remarked doubtingly, "anyway I feel some better."

H. H. WINDSOR.

SIGNAL PROTECTS AUTOS FROM REAR-END COLLISIONS

The round, wheel-like device on the top of this automobile is intended to



New Safety Signal

notify vehicles that may be following the machine on which it is displayed that the chauffeur is about to make a turn or stop. It was specially designed for the auto-cabs of London, but can be used on any machine that has a top. When not in use it shuts up like a fan. Around its edge is the word "Attention," and it is illuminated for night use.

NOVEL STORE ADVERTISING

A novel form of advertising is being used with good results by merchants in many of the larger cities. The idea is simple and inexpensive and can be utilized in the smaller cities as well. Where use of the sidewalks is permitted a glass case about 24 in. square is placed in front of the store. The floor is raised about 18 in. from the sidewalk and an attractive looking young woman is seated in the case.

She is supplied with one or more of the latest novelties or specialties of the store, and with each article is a set of plainly printed cards, each containing one short sentence. These she holds up to be read by the passing crowd, many of whom are attracted to see what comes next.

For instance, if it is a new store, the cards run something in this order:

DO YOU WEAR SHOES?

HAVE YOU SEEN THE VERY LATEST THING IN SHOES?

NOW WATCH! IT'S COMING.

Then, holding up the shoe in one hand, the cards follow after this order:

HERE IT IS! JUST NOTICE THE—

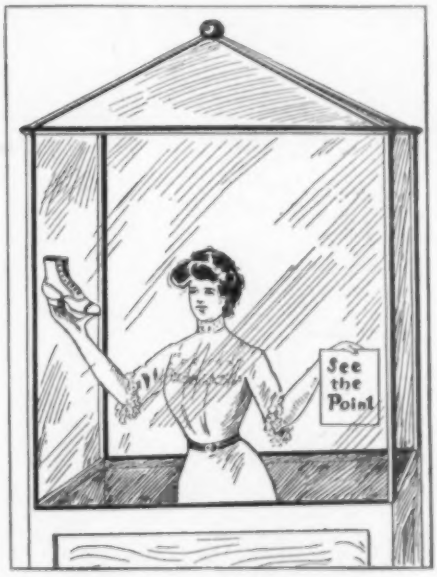
BEAUTIFUL QUALITY OF LEATHER, AND

ITS ELEGANT SHAPE. DON'T YOU THINK—

THIS SHOE IS WELL WORTH $5? BUT—

THE PRICE TODAY IS ONLY $3.65.

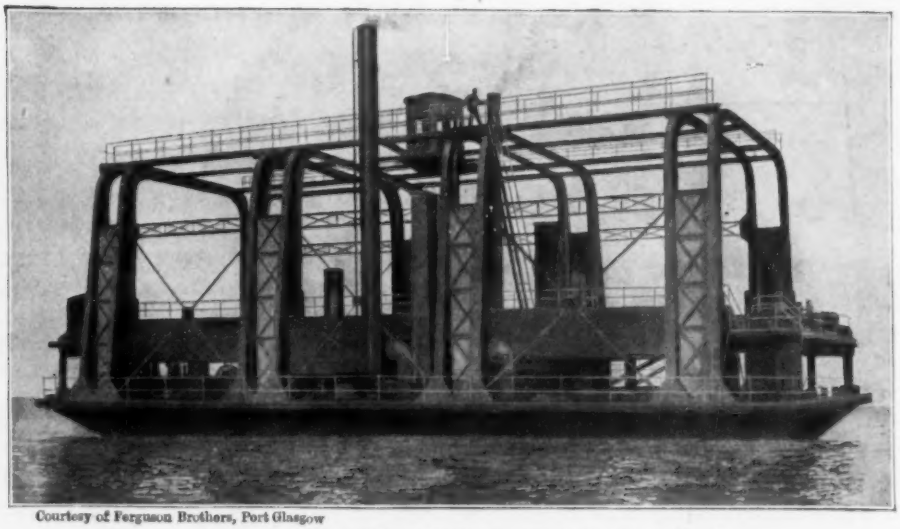
STEP INSIDE AND LOOK AT A PAIR. IF YOU ARE NOT PLEASED YOU WILL NOT BE URGED TO BUY.



Talking with Sign Cards

In this way quite lengthy descriptions can be made, as the novelty of anticipating what is coming next will hold many people out of curiosity.

CURIOUS VEHICLE FERRY ON RIVER CLYDE



Courtesy of Ferguson Brothers, Port Glasgow

Ferry for Tide-Water River Has Elevating Load-Floor

This ferry is unique in its construction as well as in its use. It has recently been placed in commission on the River Clyde at Finniston, Scotland, to transport lorries and vans across the stream. (A lorrie is a cart or truck of the type used in mines and tunnels.)

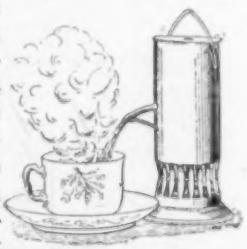
The construction of the load-floor is such that it can be raised or lowered so that the ferry can be used at all stages of the tide, it being so counterbalanced as to require but little power for this operation. The approaches to the river are so congested that there is no room to have them sloped and the ferry runs into small entrance locks on both sides.

The ferry was built at a cost of $125,000, and can carry about 20 vans.

End View of Ferry

AN AUTOMATIC COFFEE POT

This coffee pot, the invention of a Parisian, is absolutely automatic. The ground coffee is placed in the pot with the required amount of water and the wick of the alcohol lamp is lighted. When the coffee is sufficiently boiled it pours itself into the cups. The coffee is placed in a perforated box in the lid of the pot. A tube runs from the coffee box to the bottom of the pot, and the water, on boiling, mounts this tube



and circulates through the coffee. The liquid then passes into another tube which carries it to the cups. The alcohol lamp is automatically extinguished the moment the coffee is sufficiently boiled.

PLATE GLASS SWITCHBOARD

A glass switchboard has recently been installed in the new high school at San Jose, California, where it is of great educational value to the students in the electrical course. The total cost of the installation was $1,500 and it is claimed to be the first plate glass switchboard ever built.

When first cast, the plate glass was 2 in. thick, but ¼ in. was ground off of each side in the polishing process. The holes bored to accommodate the 45 switches and two meters mounted upon it number 600. The switchboard is inclosed in a cabinet, the front and back of which are also of plate glass. This gives the bus bars and wires, which are on the opposite side from the switches, the appearance of standing in mid air. One item of considerable expense was the polishing of the hundreds of copper washers used, both sides of which had to receive this treatment.

Switchboard of Plate Glass to Enable Study of Construction

CONSTRUCTION OF CONCRETE BOATS

Italy, so far, is the only country to extensively take up the construction of concrete boats. The methods used by the Italian engineers in concrete shipbuilding, gleaned by the United States consul at Rome, are therefore of great interest. He says:

"It is well known that concrete, when brought into contact with water, steadily acquires greater compactness and resistant power, and that having attained the maximum in these qualities, it retains the same indefinitely, without deterioration.

"While it has been demonstrated that cement possesses the highest degree of resistant power under the strain of compression, this is not the case in an equal measure when the strain is of permanent tension, and in still a less degree as regards shock resulting from collision.

"After long study and trials the problem found a complete solution in the use of reinforcement of uniform resistance, consisting of a skeleton of iron or steel, enveloped in sheets of metallic network. Provision is made with respect to the particular points upon which the greatest strain would fall resulting from contact with any solid body, by strengthening these points with additional reinforcement.

"By this method the need of costly forms for casting is obviated, and the employment of minimum thickness

made possible. By a happy combination the iron reinforcement is absolutely preserved from rust, owing to its being covered by a layer of cement. Both the iron and the cement have the same coefficient of expansion, properties well established by experiments, and there is no fear of the detachment of the iron from the cement owing to sudden changes of temperature."

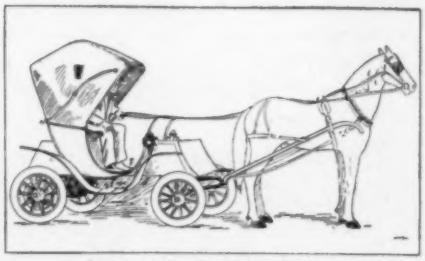
FRENCH DEVICE AIDS IN SHAVING

This small French invention is designed to quicken the process of shaving, and, according to one of the Paris scientific magazines, succeeds in its purpose. It consists of a small convex surface composed of xylonite, which is a soluble ferment much like ivory in appearance. To this is attached a handle which makes it easy to hold.

The person shaving lathers the face in the usual manner, but for a shorter period. Then the xylonite is pressed or gently patted against the soap-covered skin, compelling the soap to penetrate it and soften the most unruly growth of beard. It can also be used after the shave to soften the skin.

AUTOMOBILE FITTED WITH CARRIAGE SHAFTS

A manufacturer of carriages in Ravenna, Ohio, has an electric automobile which is used a great deal by his wife in enjoying the surrounding country. But on a number of her trips the batteries refused to hold out and it became necessary to hire farmers to haul the machine home. To make this task less difficult he fitted a pair of shafts to the machine. When not in use they are hung underneath the body of the car, and when the necessity arises they are unstrapped and fastened to the front of the springs.



Automobile Problem Solved

ARMENIAN DAIRYMAIDS

This photograph, which was taken near Marsovan, Armenia, shows two of the dairymaids of that country making butter in a goat-skin churn. It is distinctly a primitive but effective method. They swing the churn to and fro.

Courtesy London Sketch

Goatskin Churn

Count Zeppelin's dirigible airship has been officially taken over by the German government.

LOS ANGELES ATTACKED FROM AIRSHIP

Confetti Bombs Dropped in City at Night Show How Easily Real Explosives Dropped from the Air Could Destroy Fortified Cities

For 1 Hour and 30 Minutes Knabenshue Sailed Over Los Angeles at Night and Dropped Confetti "Bombs" on the Helpless Citizens

To demonstrate how easily a fortified city could be destroyed by bombs dropped from airships at night, Roy Knabenshue sailed over Los Angeles on the night of December 18, and dropped confetti bombs onto the heads of the thousands of people who thronged the business district to try and sight him. The word "fortified" is used because, according to the International rules of war, accepted and enforced by all the powers, a city that is not fortified cannot be bombarded by a warring foe. It is also necessary to give a fortified city notice 24 hours before bombardment commences, to allow the women and children to escape.

Only once was Knabenshue's presence above the city discovered, and that was when he turned a miniature searchlight on the crowd of people surrounding the city hall, just before dropping bombs among them. The airship started on its journey about 10 o'clock, and

20 minutes later the first bomb was dropped. After "blowing up" the city hall and the greater part of the business district, Knabenshue made a trip about the residence portions of the city, traveling in all about 18 miles. The trip lasted about 1 hr. 30 min.

The test was considered conclusive that a fleet of airships could easily destroy a city without danger to the aerial fighters themselves. Airships can, and will, in the next great war, play a great part in engagements on the battlefield and in bombarding fortifications, but whether they can be used without serious danger of being destroyed by the enemy they are attacking has yet to be proved. A large number of searchlights piercing the darkness over a city or battlefield would make it impossible for airships to remain undiscovered if sailing lower than a height of two or three miles. Even at such heights, however, bombs could be dropped with sufficient accuracy to accomplish incalculable damage, and the chances of being struck themselves by missiles from the earth would be greatly minimized.

"I think I have demonstrated perfectly how easy it would be in time of war to work incalculable damage to the enemy's country," said Knabenshue after his flight. "I have always maintained that a fleet of airships would end a war as quickly as gun fire could start it. Aerial craft must play a great part in any future war, and the side that has the largest and most efficient aerial equipment will win."

The authorities on warfare of nearly every great power contend that the destructive power of a fleet of airships in future wars cannot be overestimated. Every country now realizes the potency of this new war weapon, and many of them are systematically preparing to launch into the air a formidable fleet of such craft should trouble arise.

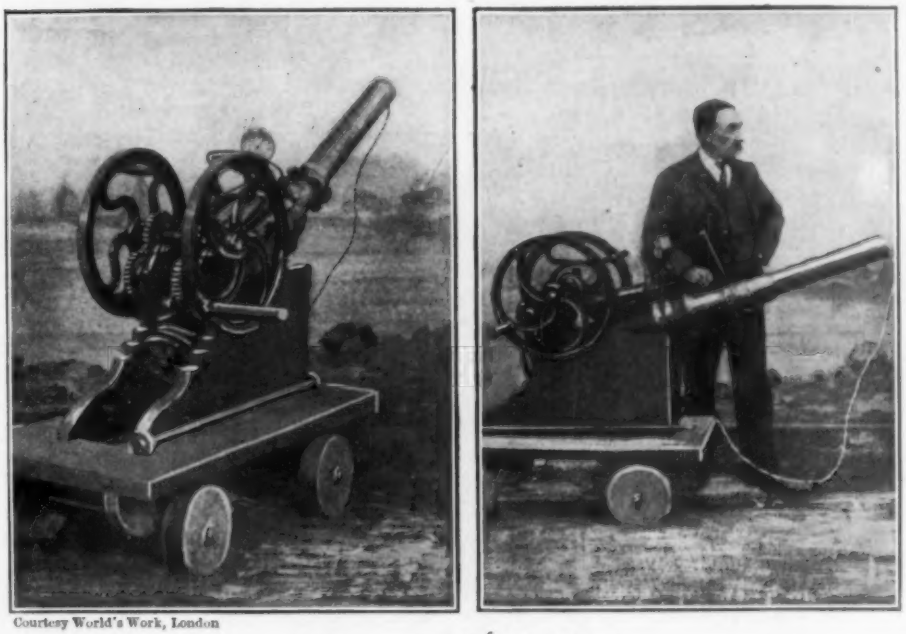
There is much talk at the present time of an unavoidable war between England and Germany within the next few years, and Germany, at least, is consistently organizing a fleet of airships. England's seeming lack of initiative in this new means of warfare has been scored within the last couple of months by such English war experts as Lord Roberts, one of the greatest of that country's generals, and Sir Hiram Maxim, the great inventor. The German Emperor, his army, and his people, have become madly enthusiastic over Count Zeppelin's dirigible airship. The army is proceeding in a business-like way to perfect its present types of airships and to increase their number. The German is a stolid race, not given to sudden and unwarranted enthusiasms, a fact that leads more than one authority to assert that Germany is confident that aerial war machines will offset the great advantage England has always held in her immense fleets of warships.

OLDEST IRON SHIP IN THE WORLD

The United States man-of-war "Michigan," although still in service on the Great Lakes, is the oldest iron ship in the world, having been built on the shores of Lake Erie in 1842, almost 69 years ago. She was a veteran when Ericsson's "Monitor" threw all the navies of the world into the junk pile, and many and many a generation of fighting ships have come and gone since then. Her iron construction was a novelty in naval work, but for years afterwards the United States continued to build wooden ships for its navy, including the famous "Kearsarge," which was built 20 years after. Even the "Constellation," a wooden ship that shares the honors of the old sailing vessels of the navy with "Old Ironsides," did not come until 1854.

The material for the ship was dragged across the mountains from Pittsburg to Lake Erie, an infinitely harder task than it would be now to transport enough material for a navy of great battleships. The plates and angles, bars and beams, bolts and rivets, forgings and castings were all made at Pittsburg.

AIR-CANNON THROWS LIFE LINE



Courtesy World's Work, London

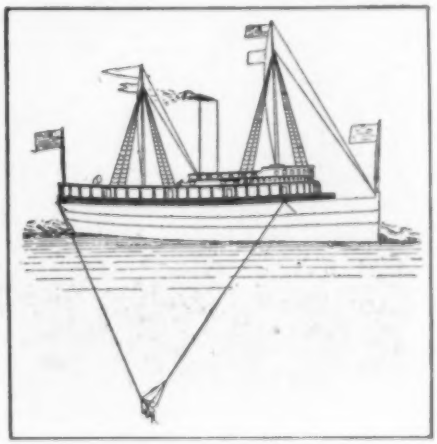
Air Cannon to Throw a Life Line

An English inventor has devised the air cannon shown in this illustration as an apparatus for throwing a life line from the shore to stranded vessels, or from stranded vessels to the shore. The cannon is 5 ft. in length and has thrown the line 2,700 ft., or a little over half a mile, in experimental tests. A crank attachment is used to compress the air in the chamber of the gun. When the required pressure is shown by the gauge the compressed air is unloosed. The line is coiled in a receptacle of the gun carriage just under the gun.

The Line-throwing Appliances Committee of the English Board of Trade, which is the body of that country having supervision of such matters, has shown great interest in the invention. The discharging force being compressed air, enables the gun to be operated in the closest proximity to the most combustible cargo of a vessel without fear of trouble.

A SHOAL-WATER ALARM

This device, consisting of a drag cable with an inclined blade at its end, and a stop cable to limit the depth to which it shall sink, is designed to notify the ship's officers when shoal water



Warns of Shallow Water

is struck. An electric circuit connects a signal device in the wheel-house with the contact piece at the end of the drag cable. When this strikes the bottom the fact is recorded by the signal.

CONCRETE PILING FOR RIVER DIKES

Government Experiments Indicate Important Results

An interesting experiment to determine the value of reinforced concrete piling for use in protective and improvement work on the interior waterways is being made at Elwood, Kan., opposite St. Joseph, Mo., under the supervision of Capt. E. H. Schulz, U. S. A., the government engineer, who is in charge of the improvement work of the Missouri river. In his investigations he found that wooden piles, heretofore used exclusively in river work, not only are becoming more costly, but also were short lived.

Sinking Concrete Piles

In exposed places, the wooden timbers rarely resisted the grinding of the sand and ice more than three years. In less exposed places, their life was ten years. In the vicinity of St. Joseph, one of the worst river stretches, dikes have been washed out season after season, often with serious property loss, as in the case of Elwood, and it became a problem to secure piling of sufficient length, weight and strength, to resist the force of the water. Captain Schulz believed concrete piling would answer the purpose, and at the most exposed portion of an 1,800-ft. dike he has driven 250 piles, of concrete. If they successfully resist the ice and scour during the winter and the floods of the spring, further experiments will be made next autumn. If the experiments continue successfully, the concrete pile will be adopted exclusively.

The experiment is watched closely by officers in charge of improvement work on other rivers, and no doubt if the plan proves the value of concrete piling for river work, they will be adopted as the standard for the Mississippi and other waterways.

The piling used on the Elwood work was manufactured of sand dug out of the river bars, cement and ordinary crushed stone, the formula being one part cement, three parts sand and four parts stone. They ranged from 41 to 55 ft. in length, the smallest weighing 6,000 lb. They were moulded square, 14 in. thick at the top, tapering to 8 in. at the bottom. The reinforcement consisted of four ¾-in. steel rods, bound every 18 in. with ¼-in. rods.

The piles were used when seven days old, being sunk with a jet, instead of a hammer. They were sunk in a triple row, and bound together with wooden braces, secured to the piling with ¾-in. bolts. No outside armor is used, the jet method of sinking making it unnecessary.

Concrete piling has been used for several years in harbor works on the

seacoast and the lakes, but those sunk at Elwood are believed to be the first ever used in river work. The general method heretofore followed has been to sink steel forms and then fill them with concrete, but this method is too expensive to be practicable in such large operations as river improvement work. It is figured that the cost of the Elwood piling will be one-fifth more than that of wooden piles of similar size, but that the additional outlay will be offset by the longer period of usefulness. With a project contemplating the expenditure of $42,500,000 for the improvement of the Missouri river between the mouth and Sioux City, 800 miles, the use of concrete piling will give a big impetus to the cement industry in the Middle West.

CHEAP AND PRACTICAL WATER TANK

This water tank is built of common galvanized iron, reinforced by steel hoops to protect it from the danger of bursting. Galvanized iron is much cheaper than steel, and when provided with steel hoops is claimed to be a safe receptacle for water. It is located on a California farm.

A Water Tank of Galvanized Iron

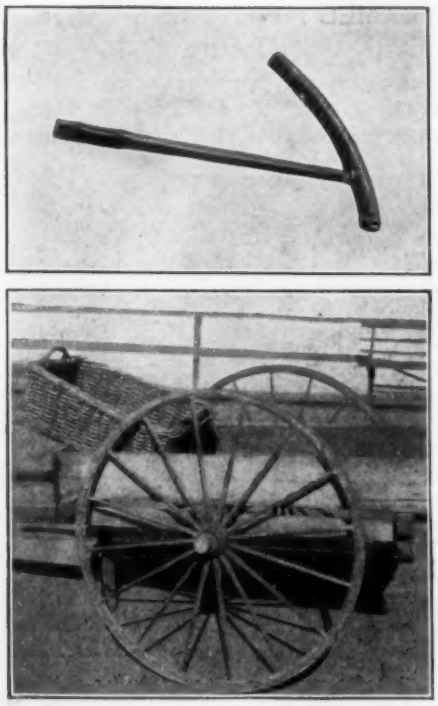
CAMEL MEAT FOR SALE IN PARIS

The latest food delicacy in Paris, or at least what is claimed to be a delicacy, is camel meat. Eight camels, known to the butchers as "Meharis," were recently received and a number of them were sold for eating. The prices asked for the meat ranged from 35 cents a pound for inferior pieces to $1.25 a pound for the undercut and the hump. The meat is said to be as tough as gristly beef, but the Parisian searches for sensations in the food line as well as in everything else.

Choice Cuts of Hump at $1.25 per Pound

JAPANESE WHEEL-MAKING

Every country has its own way of doing things. Sometimes the methods employed to accomplish the same object differ greatly, and in some instances they are almost identical. This not only applies to the mechanical, but to statecraft, business, and every other field of endeavor. It is also not impertinent to remark that every country believes its own methods to be the best.



Felloe and Spoke of Japanese Wheel

The method adopted by the Japanese in making wheels differs to some extent from that used in America and Europe. The felloe, which is a section of the wooden rim of a wheel, is sawed from a natural curved piece of wood, and has square holes for fitting the spokes. The joining of the felloes is accomplished with little oblong pieces of hard wood instead of the usual round pins generally used in this country. Near the hub the spokes have a peculiar shaped oblong portion of wood, and the axle nuts are usually covered with brass caps.

The illustrations show the felloe and spoke of a Japanese wheel, and a completed wheel. Although labor is cheap in Japan, America is shipping ball-bearing wheels to that country.

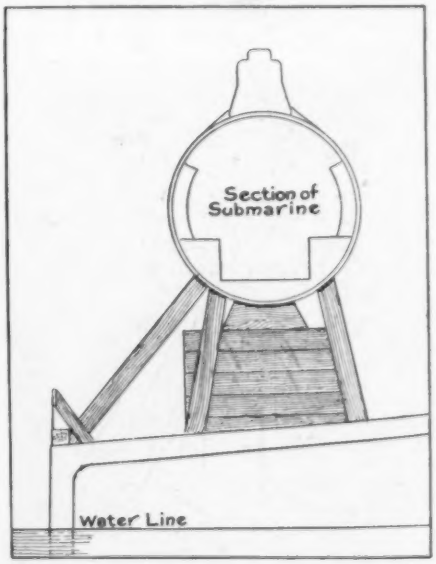
The clock in the tower of Columbia University is one of the most correct in the world, only erring about six seconds a year.

TRANSPORTATION OF U. S. SUBMARINES

Many novel methods have been proposed for the over-sea transportation of submarines, but the method here described was actually used in the transportation of two submarines from the New York navy yard to a distant port on a collier.

In a paper read before a meeting of the Society of Naval Architects and Marine Engineers held in New York, Naval Constructor W. J. Baxter, U. S. N., stated that the method proved highly successful, and that it was economical, simple and safe. The most interesting feature of the undertaking was the method resorted to in launching the little under-water fighters when their destination was reached.

The submarines transported have a length over all of 64 ft. 9 in., and a diameter of 11 ft. 10 in. The collier has a length over all of 322 ft., an extreme breadth of 43 ft., and a depth of 23 ft. In preparing the plans for the transportation a model of a submarine was made to a three-quarter-inch scale and launched from different model-cradles into a wooden tank. These



Method Used to Transport Submarines

launchings were made under various conditions of trim (imitation of course) and under various conditions of inclination. The experiments having thoroughly confirmed the calculations, working plans were prepared with a view to placing the submarines on the starboard and port sides of the collier's after deck, their midship sections being abreast the mainmast.

The launching ways and tripping devices were of practically the same type as those usually used in launching sideways, with the difference that four launching ways and cradles were used, two at each end, each pair being so tied together that they acted as sleds. The entire weight of each submarine was carried on four heavy cradles and three solid chocks. These chocks, placed between the cradles, were so arranged that, at the time of the launching, they could be wedged to take all the weight and permit the removal of the cradle sleds for the purpose of lubricating the ways. They were thus removed when the time came for the launching, and then replaced, and the chocks knocked down, leaving the entire weight of the submarine on its two cradle sleds, ready to be let go by the cutting of a rope at the proper moment. One of the illustrations shows the launching of one of the little vessels.

The other illustration shows, in a general way, the arrangement of the cradles and props on the deck. The deck beams were thoroughly supported

Launching Submarine from Deck of Collier

to withstand the weight of the submarines. In addition to the numerous props, or shores, as they are called in the language of the sea, heavy wire-rope lashings were used to secure the submarines to the deck, and to one another, so that the roll of the collier in a heavy sea would not affect them.

The submarines were prepared for shipment by removing all small portable fittings, the storage battery, and the rudders. The propellers were not removed, and the engines were suitably braced to prevent any racking. When the collier was ready a large floating derrick hoisted the submarines out of the water and landed them on the cradles.

A PALM-TREE HEDGE

The palm-tree hedge shown in this illustration is one of the most beautiful roadway borders in California. The trees were set out close together when small. The trunks are now over 2 ft. in diameter, and have the appearance of a solid wall from a distance.

The United States annually produces something like 80,000 automobiles, while France produces 40,000 and Italy 25,000.

A Beautiful Hedge of Palm Trees

ANOTHER WAVE MOTOR

Every few months some inventor appears with a new scheme of harnessing

Wave Motor Plant

the waves, but after a short trial the motor disappears into the ocean and the inventor into oblivion. The solving of the problem, however, will undoubtedly come some time and on a practical scale.

The latest wave motor has been erected along the famous Cliff Drive that skirts the ocean shore north of Santa Cruz, Cal., and it is claimed that it is doing good steady work. The plant consists of two wells, a force pump, counterbalance float, derrick, pipe, and a large tank with a capacity of 5,000 gal. The wells are sunk one behind the other on the sheer cliff facing the sea, and reach from 35 ft. above high tide to below low water mark. These wells open out at the bottom into the sea, having direct communication with the waves. In the outer well a counter-balanced float rises and falls between vertical guides as the waves raise and lower the water level. In the second tank, the plunger of a common force pump, working in any part of a long pump barrel, forces salt water up 125 ft. into the tank. During ordinary weather this wave motor is claimed to fill the tank in about an hour. As a usual thing the force pump works steadily.

AN AUTOMOBILE ELECTRIC LIGHT PLANT

During the Vanderbilt Cup race on Nov. 24, 1908, it was necessary to have illumination and 55 electric lamps, each requiring 110 volts and giving 16 cp., were placed in service. The most im-

An Automobile Drove the Generator

portant consideration, of course, in an electric-lighting system, is a plant to generate the electricity, but the absence of such a plant was soon remedied by utilizing an automobile to drive a small generator. The automobile used was a 30-hp. roadster. The tire was removed from one of the rear wheels and a belt was passed over the rim of the wheel and connected with the dynamo, as shown in the illustration.

It will be seen from this article that an emergency electric plant can easily be rigged up with any automobile by simply jacking up the rear part of the car and connecting a belt with one of the wheels.

MAGNIFYING ATTACHMENT FOR MANY PURPOSES

The magnifying-glass attachment shown in this illustration can be placed on pencils, penholders, medical instruments such as circular thermometers, and dissecting instruments. The contrivance is extremely simple, consisting of a common magnifying glass in a metal holder. The holder is so arranged as to be easily fitted over the instruments on which it is to be used. It is a French invention.

THE SABOTS OF FRANCE

Bethmale in France still remains unique because of the costumes of its inhabitants, especially the wooden shoes shown in this illustration. The Bethmale sabots, with their long, sharp-pointed toes, are famous. They are studded with various designs.

A TALL STACK AT CLOSE RANGE

The photograph of this steel smokestack was taken from a position close beside its base. It is 125 ft. in height and has a diameter of 52 in. The specks on its top are workmen. It is a twin stack, as the photograph shows, and is near Santa Cruz, Cal.

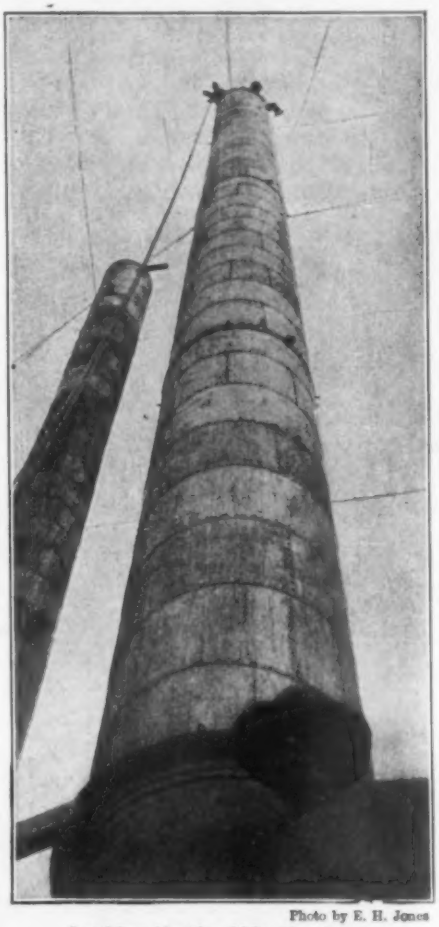


Photo by E. H. Jones

Looking Up the Side of a Stack

The letter postage rate between the U. S. and Germany is now only two cents an ounce.

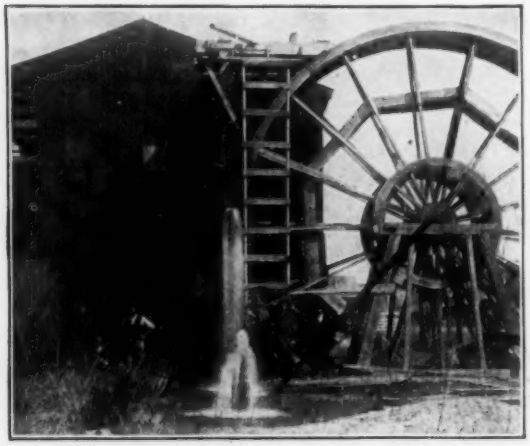
HARNESSING ARTESIAN WELLS TO THE WHEELS OF INDUSTRY

Georgia Has 400 Such Wells, Some of Which Furnish Power to Run Small Mills —Artesian Wells Furnish Fire Pressure for Gulfport, Miss.—The Development of This Source of Water Supply is Growing Steadily in the Mississippi Valley

By S. Mays Ball

The majority of artesian wells are developed with the object of obtaining water for domestic purposes, but many wells have also been put down for such purposes as irrigation, heating, and power, and the number is steadily growing. In a few instances attempts have been made to utilize the pressure of artesian wells in the southern part of Georgia for the purpose of operating machinery, and, in the main, these attempts have proved successful.

At Montezuma, Georgia, J. H. Wilson uses the water from two wells to furnish power for operating a cotton gin. The water wheel, with the pipes from



Cotton Mill Operated by Power from Artesian Well—A Great Mill Wheel Turned by Water from an Artesian Well—This Artesian Well Operates a Hydraulic Ram—Artesian Drinking Fountain in Georgia.

the well disconnected for the time being, allowing the water to run to waste, is shown in the first illustration. The wheel is 36 ft. in diameter. There are 15 wells in Montezuma, and the flow of water is abundant. Two of the wells receive their supply of water from the first water-bearing stratum, eleven from the third, and two from the fourth. These strata range in depth from 200 to 700 ft.

A well at Oglethorpe, Macon county, has a steady flow which furnishes water in the town square. This well is shown in the fourth illustration.

There are 13 wells at Wadley, Georgia, all flowing and furnishing about the same character and quantity of water. The first of these wells was put down 15 years ago, and since then they have become so numerous that the amount of flow from the older wells has perceptibly decreased. An attempt was made some time ago to run a mill by water from two of these wells, but the experiment proved unsuccessful. Since then, however, the well shown in the third illustration has been utilized to operate a hydraulic ram which forces water into the tank-house of the Central Georgia Railway, located on a high elevation several hundred yards distant.

At Tarboro, Georgia, the firm of N. B. Stafford has three artesian wells, which are used for domestic purposes and to operate a small rice mill and a circular saw for cutting wood. Two of the wells are 6 in. in diameter, and the other is 2 in. in diameter. They perforate two water-bearing strata, one at a depth of 175 ft. and the other at a depth of 360 ft., and cost an average of $350 each. The mill is shown in the second illustration. The wheel is about 20 ft. in diameter. The pipe from the well discharges into a tank just above the wheel.

The artesian wells in the city of Albany, 14 in number, have practically the same depth, and the water rises to the same height above the surface in each. These wells constitute the water supply of the entire city. The water is pumped directly from the wells to a water tower.

At present there are within the corporate limits of Savannah no less than 50 artesian wells, and it is doubtful if any city in the south has a more complete or wholesome water supply. The water is at present obtained from 13 wells, all of which are 12-in. in diameter. These wells vary from 475 to 700 ft. in depth, and supply the city with 7,000,000 gal. of pure crystal water daily. They are located along an irregular line about 100 yd. apart, the water flowing into a common aqueduct which has a sufficient grade to carry the water with considerable current to the pumping station.

The sanitary effect of the artesian waters on the general health of the towns, cities, and communities where they have been used for a number of years is excellent, materially lessening the prevalence of chills and fevers in southern Georgia. The little city of Albany is a fine example. It has a population of about 15,000, and is situated on the banks of the Flint river, with numerous swamps and low-lands near by. Before the completion of the artesian wells the drinking water was obtained from shallow surface wells, and the city was considered one of the most unhealthy in Georgia. New Albany, with the sanitary conditions further improved by drainage, is considered almost a health resort. The communities of Brunswick, Bainbridge, Leary, and Fort Gaines have experienced similar results.

The artesian wells of southern Georgia are confined to that portion of the state lying south of an irregular line connecting Columbus, Macon and Augusta. There are now nearly 400 wells in this district, which number is being increased annually by the completion of from 5 to 20 wells.

The thriving city of Gulfport, Mississippi, with a population of about 10,000, is also an excellent example of the development of artesian wells in the south. Its water supply not only comes from artesian wells, but the pressure is sufficient to drive it through the water mains as well. This pressure is great enough for

ordinary use in fighting fires, even though the city has buildings four stories high. Fire engines are available, however, should their service be required.

Artesian wells, developed for irrigation purposes, have long been in use. Many of the garden spots, or oases, in the Sahara desert are kept green by water from flowing wells. China, Italy, Spain, and the western part of the United States, each annually employ large quantities of artesian waters for irrigation. The most extensive systems of such wells in the United States are in the San Joaquin valley, California; in the Great Salt Lake desert of Utah, and in South Dakota.

It is a well known fact, demonstrated by all deep wells and mines, that below the depth reached by annual variations of temperature there is a gradual increase of heat, averaging about 1 deg. F. for every 55 or 60 ft. of descent. By such reckoning a well 2,000 ft. in depth will furnish water having a temperature of 80 or 85 deg. F. The amount of heat daily liberated from such wells is often very great, and in many instances it has been utilized. Large manufacturing plants in Wurtemberg, Germany, are warmed by this means, and a number of gardens in Saxony and in France are kept at uniform temperatures.

Artesian wells are deep bores through impervious rock strata to a porous water-bearing rock stratum whence the water flows to the surface and is discharged from the bore. The principal condition of an artesian well is a pervious stratum protected above and below by a water-tight bed. These layers come to the surface in some elevated region where they get their rain flow, then pitch downward to a considerable depth and then rise again, thus forming a great basin which retains the water. Rain water and surface water fill the stratum to the brim, and if the stratum is tapped, the water will rise in the bore and flow as long as the supply equals the demand. The oldest artesian well in Europe was sunk in 1126 in the French province of Artois, thus receiving the name "Artesian."

SAFEGUARDING DEAF BICYCLE RIDERS

With a view to safeguarding deaf and dumb members of its organization, the Cycle Touring Club, of England, has designed the badge here shown to be carried at the rear of the bicycles of those afflicted. The drawing depicts the dilemma of a motorist who has run into a crowd of them. It is considered that the most hardened and bloodthirsty speed maniac will hesitate before

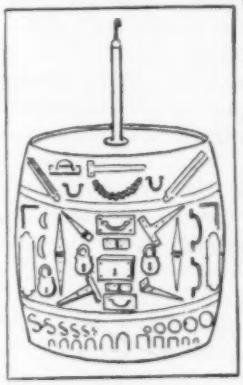
Courtesy Motor, London.

Deaf Mutes on a Bicycle Tour Protected by Signal

running down a bicyclist who is displaying such a sign. It is expected, also, that the affliction will spread rapidly as soon as bicycle riders realize the protection such a badge makes possible.

ARRANGEMENT OF CASK FOR WINDOW DISPLAY

Originality does not always mean something new, but sometimes something old in a new place. An English hardware dealer suggests that instead of placing locks, hinges, bolts, etc., on a plain shelf in the window, it would be much more interesting to take an ordinary barrel, paint it red, green, or blue, and fix articles for display upon it. Such a device hung in a display window would draw attention, not because it is specially ingenious, but because it is something new. Curiosity is a mighty factor anywhere.



A MARVELOUS "LIVING SKULL"

The "living skull" shown in this illustration is one of the most ingenious of the marvelous creations of Joseffy, probably the greatest living magician. There are many skull tricks but none so completely shrouded in mystery as this.

The skull used by Joseffy is made of copper, decorated or painted in the most natural manner possible. Real human teeth are set in the sockets of the jaw. Its lower jaw is articulated so that it can move and answer questions by clicking its teeth. It can also move on its neck. When performing on the stage Joseffy places the skull on a glass plate which is held suspended by the cords at each corner. These cords are held by any members of the audience who desire to watch the trick closely. There is absolutely no thread or outside connections, yet the skull carries on a most intelligent conversation with its master by clicking its teeth.

Still Has Human Power

The magician, "Joseffy," is a Mr. Freud, an Austrian, who was born in Vienna. He is a man with a scientific trend of mind, a splendid violinist, and a master of six languages and five trades.

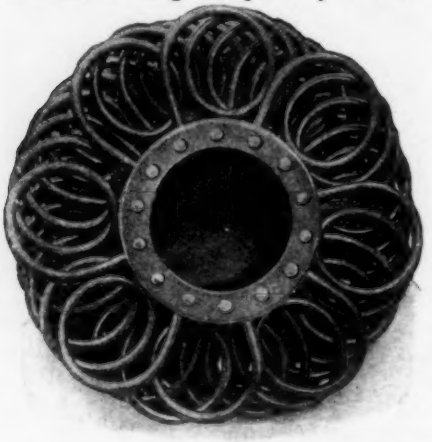
Joseffy also has a hand which he can lay upon an object anywhere and it will answer any question he asks by rapping. There is no outside connection or internal mechanism, so far as is known, and many have investigated. Recently, in Kansas City, Joseffy took the hand to a department store, desiring to purchase some ribbon for the cuff. He placed it on the glass show-case and requested it to tell the lady by rapping how many yards of ribbon it wanted, the kind, color, etc. When it began to make its lifelike motions everyone in the store rushed to the counter. The manager was unable to recall the clerks or disperse the crowd, and finally the police department was called in.

In Belgium 70 per cent of the telegrams are delivered in from 1 to 15 minutes.

As an idea for gift purposes, a New York concern is offering lead pencils for sale on which the recipient's name is stamped in gold lettering.

QUICK HEATING ENGLISH BOILER

The demand for water-tube boilers for the purpose of supplying high-pressure steam in great quantity where a small weight of boiler is necessary is continually growing. This illustration shows the arrangement of coils of just such a boiler. It is manufactured in Lancaster, England.



An English Type of Water-Tube Boiler

The boiler consists of a central drum pressed out of a single steel plate, and external coils of mild steel arranged to expose large surfaces to the hot gases and at the same time allow of cleaning. Each coil makes three turns, the ends being expanded into holes in the central drum, an arrangement which allows a perfectly free expansion and contraction without any possibility of leakage. Any coil can be removed and replaced without interfering with other coils.

RUNNING MAINTENANCE OF ELECTRIC LOCOMOTIVES

The running maintenance of the electric locomotive is much lower than that of steam locomotives, owing to the fact that the former does not require the roundhouse inspection at the end of each day's work. Electric locomotives are inspected on a 1,000-mile basis, which at present means on an average of once in every 10 days. The actual time required for an overhauling is about 3½ hours.

The largest item in the general overhauling will in all probability be the turning of tires and the painting of the locomotives. The latter will, no doubt, be the factor that will limit the time out of shop, it being a fact that the tire wear on an electric locomotive is but 1-32 in. for 30,000 miles, as compared to 8,000 or 9,000 miles on steam locomotives.

Irrigation in Mexico is being accomplished by the pumping system in preference to the older method of constructing dams.

NURSES BANDAGE DUMMIES FOR PRACTICE

In training nurses for the "London" hospital the aspirants to such service are given a seven-weeks' course at a preliminary school before being admitted to the training school in the hospital itself. The course of training includes first lessons in bandaging, in which dummy arms and legs receive as much attention as the most seriously injured human limb.

Learning to Bandage

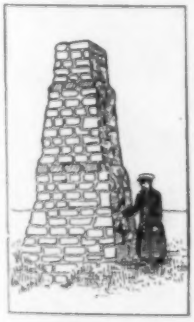
GASES CAUSE DEATH IN MEXICAN OIL FIRE

According to authentic press reports, the great oil well fire near Dos Bocas, Mexico, which burned two months, destroying millions of barrels of oil, was responsible for several deaths and widespread consternation some weeks after the actual fire was extinguished. The cause of the trouble was the escape of gases from the huge cavity left in the earth by the conflagration, its effect being felt for miles around. The fumes were so strong that metal in Tampico, a city 65 miles distant, is claimed to have turned black; buzzards, parrots and other birds died in great numbers, and the eyesight of many people at far distances was affected.

Steel ships entering the harbor at Tampico, according to the United States consul at that port, experienced the same blackening of metal. Two laborers and ten mules exposed to a current of the deadly fumes at a distance from the well are reported to have been killed, and a number of other cases are known. Immense earthen reservoirs and dykes were built to stop the spread of oil, but the fluid passed over the dykes with ease and saturated the soil for hundreds of yards.

STONE PILLARS AS TELEGRAPH POLES

When the war broke out in 1880 between Chile and Bolivia, and the need for a telegraph line between the Bolivian cities of La Paz and Oruro became urgent, it was found necessary to construct stone pillars to take the place of ordinary posts, there being no growing trees in that part of the country. Old bottles were used as insulators.



These pillars were substantially built on stone foundations, and measured 5 ft. square at the base, with a height of 15 ft. The length of the line was 156 miles, and the pillars were built 350 ft. apart, making more than 20,000 necessary.

The pillars have been abandoned for 20 years, but are still in a remarkable state of preservation.

AN ACROBATIC CLOCK

Many novel clocks are being imported from abroad at present in an effort to please the popular fancy. The acrobat in this clock automatically performs a number of very interesting feats in the most natural and methodical way. Such a clock placed in the show window of a jeweler would draw considerable attention to his wares, as the passerby usually seems fascinated by its antics.

CATCHING FISH WITH A STEEL TRAP

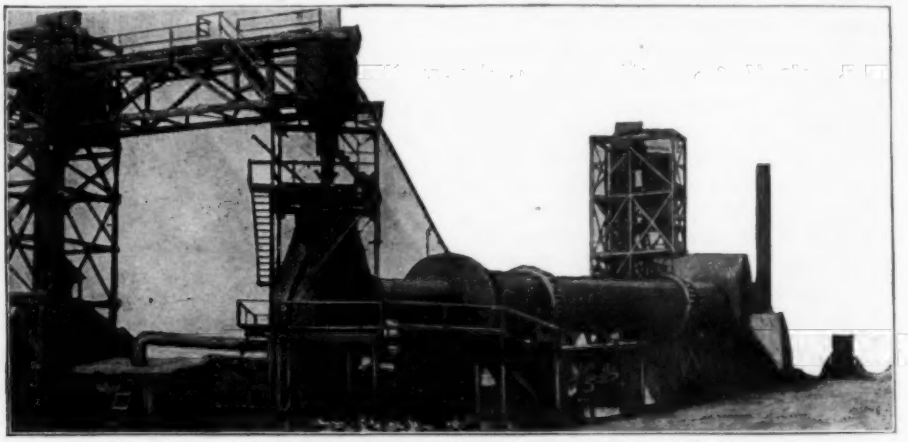
The jaws of this trap are set perpendicularly instead of horizontally and will catch fish if set under water as easily as it will catch a rabbit if set on land. It is also much easier tripped than the ordinary trap.

When used for catching fish, a hook suspended from the center is baited with cheese, meat, doughballs, or worms, according to the taste of the catch desired. The moment this hook is touched the jaws close.

The French chamber of deputies has passed a resolution to decorate with the Legion of Honor all French and foreign aviators who have conducted trials in France.

A HORIZONTAL IRON SMELTER

The difference between this iron smelter and the usual design is that it is horizontal instead of perpendicular. The long horizontal tube shown in the



Horizontal Smelter 110 Feet Long

center of the illustration is where the ore is smelted. It is 110 ft. long and 9 ft. in diameter. The advantage claimed for this type of smelter is that it retains nearly all the heat, while the upright smelter is claimed to lose about 80 per cent of it.

This smelter is in use at Iron Mountain, Mich.

SCIENTIFIC ACTIVITY ON MOUNT WILSON

Dr. George E. Hale, director of the great Carnegie Solar observatory on Mount Wilson, California, has announced that a great steel tower 150 ft. high, with a well 75 ft. deep under it, will be constructed this coming summer with which to use the spectroscope. A spectroscope is an instrument for forming and examining spectra, such as solar light, so as to determine, from the position of the spectral lines, the composition of the substance.

The 5-ft. reflecting telescope is now ready for use, and Dr. Hale predicts that a number of important discoveries may be confidently expected, particularly in the photographing of the sun's surface, as the new telescope is the most powerful in the world.

Arrangements are also being made for a wireless telegraph station on the highest point of the mountain, and it is believed that messages can be sent from it to Japan, or beyond, so perfect are the conditions.

NEW TYPES OF COAL CHUTES

Two new types of coal chutes for buildings have been devised. The first is a chute adapted to a rectangular opening and is constructed of $\frac{3}{16}$-in. steel plate, and is provided with angle irons riveted to the sides to stiffen the chute and to hold it firmly in position in the wall. It is 16 by 21 in. in size and is made for 8-in. walls.

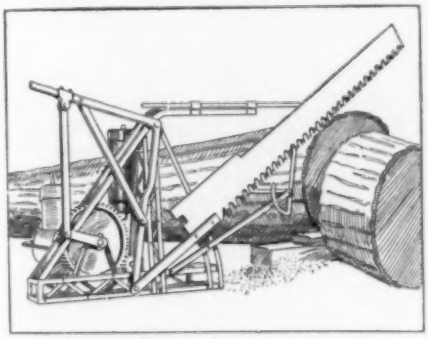
Rectangular Chute Circular Chute

The circular chute is made of No. 12 steel, and is likewise held in the wall by angle irons, riveted to the top and bottom. It is 22 in. in diameter.

SHOP NOTES

A Small Power-Driven Cross-Cut Saw

The smallest drag saw ever put in use has been perfected by a person in Washington. The saw shown in the sketch consists of a 2½-hp. marine type of gasoline engine, with ordinary bat-

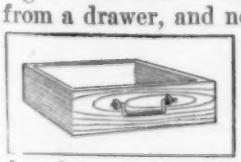


Cutting Blocks from Large Logs

tery ignition, geared in the ratio of 1 to 10 to a bell crank arm motion and connected to an 8-ft. straight-tooth drag saw. The whole saw occupies a floor space of only 16 sq. ft, and stands about 4 ft. high. The sketch, which is made from a photograph, shows a 36-in. fir log from which the saw makes a cut in about 10 min. The engine uses about 3 gal. of gasoline for each 10 hr., costing about 50 cents. As the saw weighs only 175 lb., one man can easily operate and move it about.

Home-Made Drawer Handle

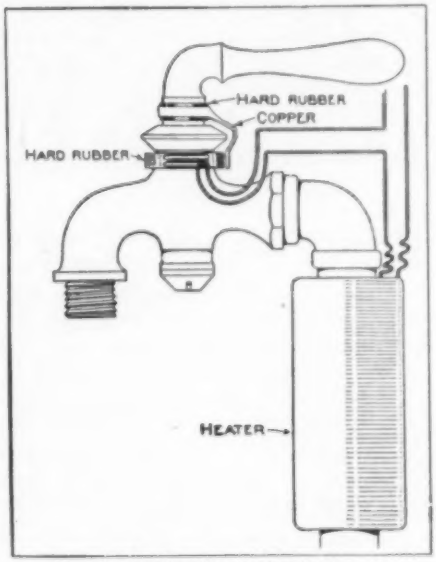
While working around the shop during a rush hour a handle was broken from a drawer, and not having time to



go to a hardware store for another, one was made as described and found to answer the purpose to perfection. A stout piece of wire was formed in the shape of a handle and two staples were driven into the end of the drawer at the proper place and over each end of the wire handle. This made a very neat and strong handle at no expense. —Contributed by R. C. McNutt, Aurora, Ill.

Home-Made Electric Water Heater

This electric water heater is made by wrapping a layer of asbestos around the water pipe, as near the faucet as possible, making the covering about 4 in. long. Place a thin layer of plaster-of-



Electricity Heats the Water

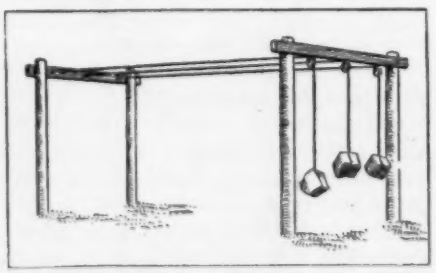
paris on the asbestos and let it dry. When dry wind a coil of No. 36 iron wire around it, taking care that the wire does not touch itself at any point, yet winding as close as possible. Put another layer of plaster-of-paris on this and allow it to dry and again wind the wire around it. Continue the process

of alternate layers of plaster and wire until over 500 ft. of wire has been used. Leave both ends extending for connections.

The connections are made in such manner that the current is turned on only when the faucet is opened. Around the stem of the faucet is fitted a ring of hard rubber or fiber insulation, over which is clamped a piece of brass or copper shaped as shown to make the contact when the faucet is turned. The contact points are fastened to another hard rubber or fiber insulation ring fastened around the top part of the faucet under the packing nut. The contact points are so located that they cause the current to be turned on the heater from the time the water starts to run until the full opening of the faucet is made, when the lever is turned to one side. When the lever is turned to the other side no connection is made and consequently cold water will run. The current is taken from a 110-volt circuit.—Contributed by Theron P. Foote, Pittsfield, Mass.

How to Keep a Clothesline Drawn Tight

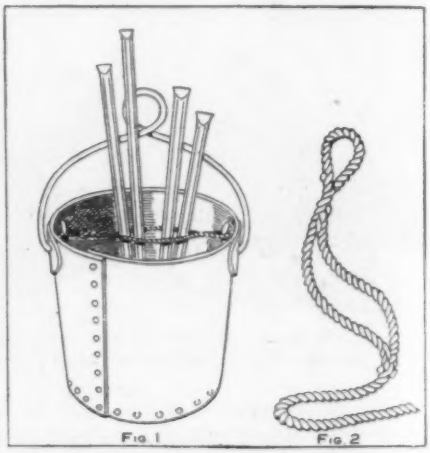
Many wire and rope clotheslines are put up between posts and kept there permanently. In so doing with a rope line the uneven conditions of the weather will cause the line to sag. An eastern farmer devised an arrangement as shown in the accompanying sketch to keep the line tight at all times. In this instance three lines were used and connected to two bars of which each bar was attached to the top of two posts and each pair of posts placed at the proper distance apart. At one end the lines run over pulleys attached to the bar and the ends of the lines are weighted. The weights would keep the lines tight at all times.—Contributed by Arthur E. Bradley, Randolph, Mass.



Weights Attached to the Lines

Lash Rope for Miner's Tools

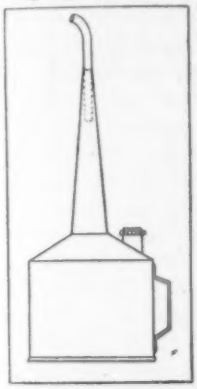
This rope is to be used in fastening tools into a mine bucket or in any place where tools are hoisted or lowered as shown in Fig. 1. The rope is made by splicing a loop in one end large enough to go over the inside end of the bail of the bucket. The cut splice is made large enough to hold all the tools necessary. If the bucket is 30 in. in diameter the cut splice should be 9 in. from the loop end and the splice 1 ft. long. To make the cut splice cut the rope 2 ft. from the loop end. Take the loose end and splice in 9 in. from the loop. This will bring the two ropes side by side. Splice the two together again, leaving the space 1 ft. long. The cut splice will then be 1 ft. long, as shown in Fig. 2. Cut the rope long enough to have plenty for a tie. Hook the loop over one ear of the bail, draw tight around the other and tie the end. Put the tools in the cut splice; the more tools put in the tighter the lash will hold.



Holding Tools in a Bucket

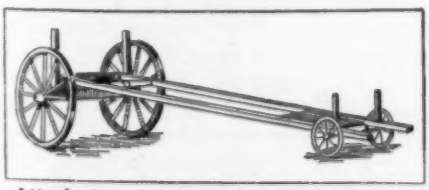
Preventing an Oil Can Spout from Clogging

Many times an oil can spout will clog up with sediment in the part that tapers down to the small end and prevent the flow of oil when it is most needed, says Railway and Locomotive Engineering. The little device as shown in the sketch consists of a piece of $\frac{3}{16}$-in. tubing reduced or made tapering to $\frac{1}{8}$-in. at the straight end and inserted in the spout of an ordinary oil can reaching at least 1 in. below the point of the spout, thus forming a pocket, as shown by the dotted lines in the sketch, that will catch all foreign matter that otherwise would plug up the taper spout. Any substance entering the $\frac{1}{8}$-in. hole will be sure to come out at the larger end.



How to Make a Low Truck

Herewith is shown a handy low truck made from the front part of an ordinary wagon. A strong oak reach about 1 ft. long replaces the longer one, says Farm Journal. To the rear end of this is bolted an iron clevis that holds a crosspiece as shown. Two poles 15 ft. long are used for the platform. About 2 ft. from their upper ends holes are bored and the poles are pinned to the crosspiece, the ends resting on the bolster about 2 in. from the standards. The rear wheels are 15 in. in diameter and turn on an iron axle.



Attached to the Front Wheels of a Wagon

How to Make a Reinforced Concrete Burial Vault

[Condensed from article by A. A. Houghton in Cement Era.)

The main advantage of concrete vaults is the hermetically sealed edges which allow no drainage water to enter, and when properly waterproofed with any good compound, and closed, it can be placed in any soil, no matter how damp, with a perfect assurance that no dampness or water will enter the vault. Any one can manufacture the forms to make this reinforced burial vault at the expense of a very few dollars and slight labor.

A box 28 in. high, 33 in. wide and 7 ft. 8 in. long is built for the core, as shown inside of the machine in Fig. 2.

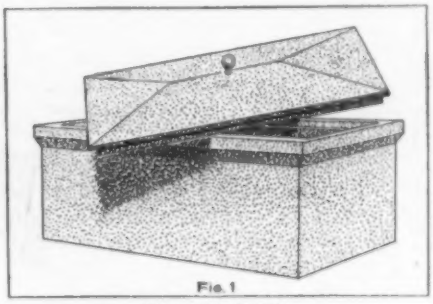


Fig. 1

Concrete Vault

This is boarded up on the sides, ends and bottom with suitable lumber and with the corners and sides braced, so as to prevent any warping. The interlocking edges are formed at the top with four 2- by 4-in. strips 7 ft. 4 in. long, and two 2- by 4-in. strips 37 in. long; also two 2- by 4-in. strips 41 in. long. The 37-in. end strips are nailed to the top of the core, projecting 2 in. outward at each end. One of the 41-in. strips is nailed on top of this, with a 2-in. projection over bottom strip at one side and both ends. The two strips 7 ft. 4 in. long are then nailed on the sides of the core with edges even with the end strips, as shown in Fig. 2, which makes a 2-in. projection around top of core for both these strips.

Two strips are nailed on top of the core to support it when moulding the

vault. These should be 5 ft. long and rest on the outside form when tamping in the concrete. Bore ¼-in. holes in the ends of the core and insert in these holes bolts about 2½ in. long. These are used temporarily and are removed when the vault is moulded. Two bolts are used at each end for each reinforcing rod used. The rods are placed as shown in Fig. 2.

For the outside form of mould, build a box, open at the bottom, which is set upon a pallet to form the bottom of the vault. The size of this box is 29 in. high, 41 in. wide and 8 ft. 6 in. long. This box is joined together at three corners with strap hinges and at the fourth corner with a clasp. The two ends are set inside the sides so as to

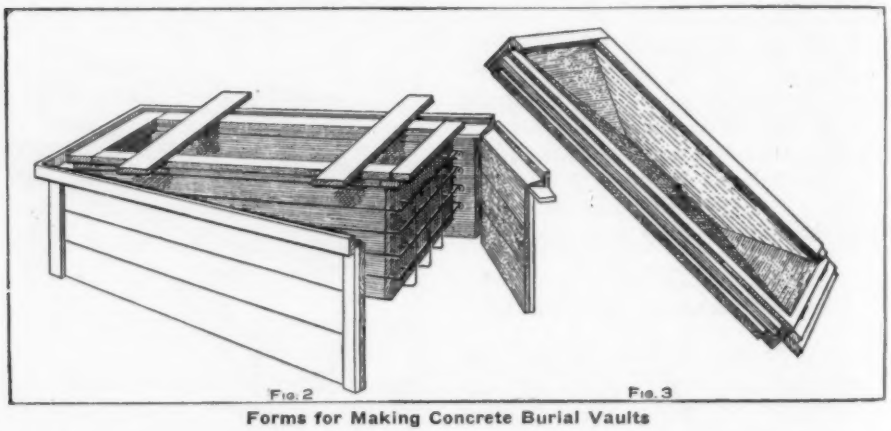


Fig. 2 Fig. 3

Forms for Making Concrete Burial Vaults

make the inside measurements exactly 41 in. wide and 8 ft. 4 in. long, when made of 1-in. lumber. The uprights on the beveled cornice are made from two boards 7 in. wide and 9 ft. long; also two boards of the same width and 41 in. long. The bottoms of the cornice are made from boards 3 in. wide, two 8 ft. 4 in. long and two 49 in. long. Nail the 3-in. boards to the top of the outside form, projecting out, placing the long strips on the sides and the short ones on the ends. Nail the two short 7-in. boards upright on these end boards so that they are in line with the main part of the outside form, which requires them to set in 3 in. on each end from the bottom boards which have just been nailed on. The two long 7-in. boards are nailed upright on the sides. The bevel is formed by using a 3-in. square piece planed down one-half, making a straight bevel, mitered at the corners, and fitted into the two boards at the top as shown.

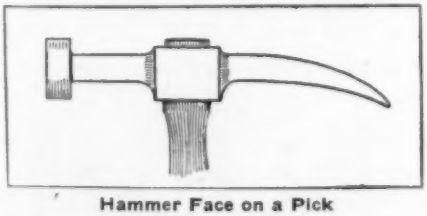
The cover mould is made by forming a box from 6-in. lumber; two boards cut 8 ft. 6 in. long and two boards cut 41 in. long. Join these together in a box with the sides overlapping the ends to form the proper dimensions for the inside. Take a 2- by 2-in. piece and cut four strips 3 ft. 8 in. long; also cut four strips from lumber 3 in. wide of the same length, and nail them to the 2- by 2-in. strips, to make a projection of 1 in. on one side. Miter completed strips and nail together, two of each joined, to form a point at one end, and the other ends 41 in. apart, on the outside, which will nearly form a trihedron. Nail these inside the box form, to mould the lid, with the 41-in. side to fit into each corner of same at the ends, placing strips 2 in. below the top, so as to allow the forms to be covered with 1-in. lumber and yet leave a 1-in. space between the highest point and the top of the box. This pointed form is to slant downward until the point is even with the bottom of the 6-in. (high) box made, which will make the skeleton form for the beveled top. Cover all four sides of this skeleton form with boards, nailing on the side boards first

to the strip projecting 1 in. from 2-in. strips, which thus gives a 1-in. space to nail the board on to the triangular ends. As these are nailed on the inside of the form it completes same, making a perfectly plain surface so as to mould the bevel top. Bore one or more holes in the bottom so as to hold the rod and ring, used to lift the cover, as illustrated.

To form the interlocking edges on the cover cut for the ends two 2- by 2-in. strips, 41 in. long, and two 2- by 4-in. strips of the same length; nail these together with the 2- by 4-in. strips projecting over the others 2 in., as shown in Fig. 3; these two completed end strips are fastened to the box form for a lid, which hinges, as shown. For the side strips cut two 2- by 2-in. strips, 8 ft. long, and two 2- by 4-in. strips, 7 ft. 8 in. long; join the same as the ends, only placing the 2- by 4-in. strips 2 in. in from the 2- by 4-in. strips on ends, as shown. These sides are hinged to the box form of lid, and they can be folded down when ready to remove the cover from the mould.

A Surveyor's Combined Pick and Hammer

The accompanying sketch shows how to make a combined pick and hammer. The tool is made from 1¼-in. stock drawn out in the shape of a pick on one end and a hammer face on the other. The pick is 9 in. long, and the hammer end is 5⅜ in. long. The face is made rounding and about 2½ in. in diameter. The tool is fitted with a regular pick



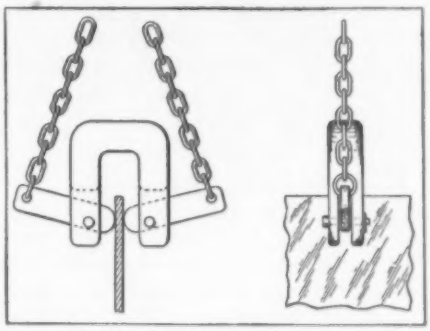
Hammer Face on a Pick

handle.—Contributed by John E. Tosney, San Francisco, Cal.

Apply lime wash before painting on a smoky wall or greasy wood.

Tool for Lifting Boiler Plate

The usual method of holding boiler plates when lifting them with a crane is by means of a U clamp suspended from the crane hook and slipped over



Grips the Plate Like a Clamp

the edge of the plate and held with a wedge, says the Iron Trade Review. As this method is rather insecure, the device as shown in the sketch was adopted in a boiler manufacturing plant which overcomes the defects of the ordinary clamp. This device consists of a U-shaped piece of steel, at the extremities of which are pivoted two levers, the ends of a chain sling being attached to the outer ends of the levers. The inner ends of the levers are rounded in a semicircle, but the fulcrum of each lever is placed eccentrically to the semicircle. Thus when the U-shaped piece is slipped over the edge of a plate, and a stress is brought on the chain, the levers act as a toggle-joint and grip the plate firmly between them. The plate can then be lifted and carried to any desired point by the crane.

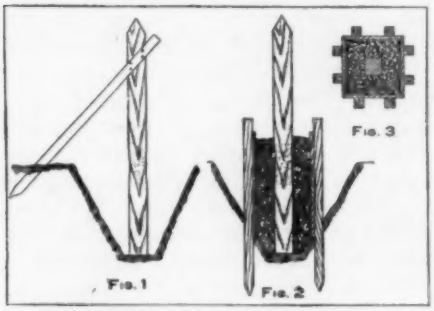
Storing Crucibles

Crucibles should be stored in a warm, dry place, either back of the furnaces on the flues, where the hot gases from fresh fires will not strike them, or on the top of the core oven, but do not put them in the core oven where they come in contact with the moisture from the wet cores; or, if stored on top of

the boilers, care should be taken to see that all steam pipes are tight and there are no leaks, and that they are away from the whistle which allows steam to escape, says Graphite. It is generally conceded that a crucible properly stored in a foundry is from 10 to 20 per cent more efficient at the end of a year. They season and solidify, and are away from the injurious effects of the damp air. The longer they are stored in the proper atmosphere the better.

Preserving Gate Posts

The remedy for a sagging gate post is a simple one and very inexpensive as well. First brace the post in such a way as to prevent its falling and then excavate around it to a depth below the frost line. Pull the post into the proper position and renail the braces, as shown in Fig. 1. Drive stakes, and place



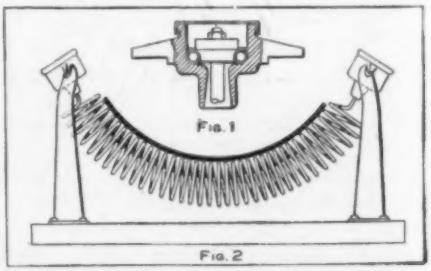
Setting a Post in Concrete

rough boards against them, as shown in Fig. 2, allowing the boards to extend 6 in. above the ground line, says Concrete Review. This makes a box or form around the post, as shown in the section, Fig. 3, into which to place the concrete. Nail several boards together to make a platform on which to mix the concrete.

Place 3 cu. ft. of gritty, clean sand on the platform and smooth it into a 3-in. layer. Dump a bag of cement on the sand and mix them thoroughly while dry. Smooth out this mixture and shovel 6 cu. ft. of gravel on top. The gravel should be thoroughly wet first. Then shovel the whole mixture from one pile to another, adding water enough to make a soft mass, turning over at least three times. Shovel the whole mixture directly inside the box and tamp with a 3- by 4-in. piece of timber. When filled take a trowel and smooth off the top, leaving the whole mass slightly higher against the sides of the post and sloping down toward the edges. After two days remove the braces and forms and fill with earth around the concrete up to the ground level. Outside of the cement the material will cost nothing, which will make a very cheap and lasting job. A wheelbarrow holds about 1¾ to 2 cu. ft. of sand or gravel.

A Curved Idler for Conveyer Belts

A new form of troughing idler pulley for conveyer belts, designed to be used instead of the usual cast-iron pulleys, is shown in the accompanying sketch. The device consists of a flexible roller, rotatively supported in horizontally pivoted ball-bearing boxes. A cross section view of one of these boxes is shown in Fig. 1. The roller is made from a spiral spring which, under the weight of the belt and its load, stretches and sags to a smooth curve of approximately circular shape and the belt bends to a troughed form in contact with, and supported by, the spring across its entire width, as shown in Fig. 2. As the spring is of the same diameter throughout, there is a rolling contact at all points between the spring and the belt. The spring should have about two coils per inch of belt width.

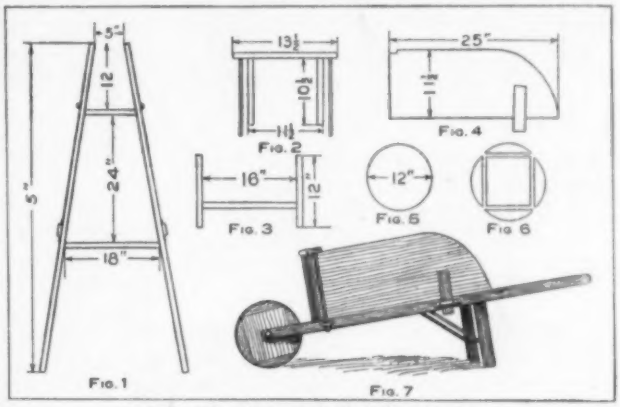


Curved Belt Conveyer

By the use of this idler the curvature of the belt is equally distributed across its entire width, and the degree of curvature is so small that wear from this source is practically eliminated.

How to Make a Wheelbarrow

The frame part of the wheelbarrow is constructed as shown in Fig. 1 from 1¼- by 2-in. material. The four joints are made with a small tenon and mortise. The front end board and standards that hold the front ends of the sides are made as shown in Fig. 2. These are placed on the first crosspiece that is 12 in. from the front end of the frame. The supporting legs are made as shown in Fig. 3 and are fitted to the under side of the frame at the point where the second crosspiece is in the frame. A solid bottom is nailed on the frame between the two crosspieces. Two side boards are made as shown in Fig. 4, with a standard on each to fit into staples fastened to the sides of the frame. The center part of the wheel is cut from a solid board 12 in. in diameter. This is reinforced by pieces cut as shown in Fig. 6. A large bolt run through the frame and wheel will make an axle.—Contributed by W. H. Troxell, Camden, N. J.

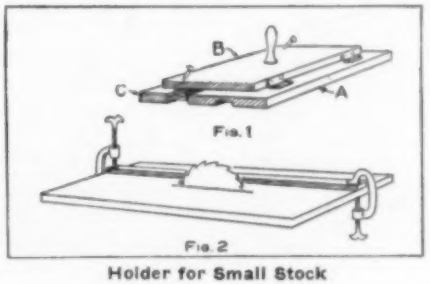


Details of a Home-Made Wheelbarrow

Sizing Small Stock

A cheap and safe way of sizing small, short material (that which is too short to size on a self-feed rip-saw) was solved by a correspondent of the Wood-Worker. Take a piece of hardwood, A, Fig. 1, 1 in. thick, 8 in. wide and 12 in. long, and plow a groove ½ in. deep and 1½ in. wide the full length of the piece. Fit a strip to this groove so it will slide freely and clamp the strip to the saw table, as shown in Fig. 2. Fasten another piece, B, Fig. 1, to the board A with a pair of small hinges. Put two wood screws through the board B and let them stick through ¼ in., with sharp ends, so they will hold the stock C. A handle placed in the board B will make it convenient to push and pull the clamp back and forth, also to raise the top B to admit the stock. The two screws in the face of the board A are used to change the size of the piece to be sawed, also to saw tapered pieces.

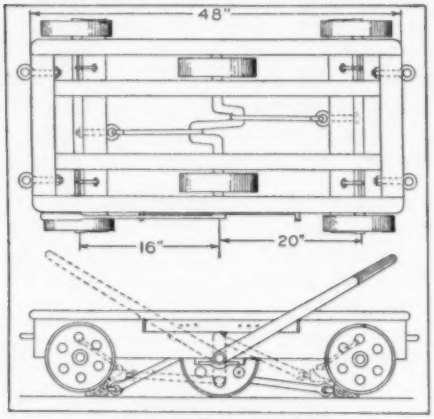
This makes a handy, safe and rapid way to saw small stock, and one man can saw as much or more than two, and with no danger of squares flying back over the saw. Bore a hole and drive a ½-in. dowel in the face of the board A, and just behind the first adjusting screw; this will push the piece to be sawed and take the strain off from the screw points. The piece can be clamped to the table with as much or little lead or clearance as necessary to make the saw run freely.



Holder for Small Stock

A Truck for a Portable Motor

This truck was designed to carry a 5-hp. motor about the shop where temporary power is needed, such as a cylinder boring machine, hoisting apparatus,

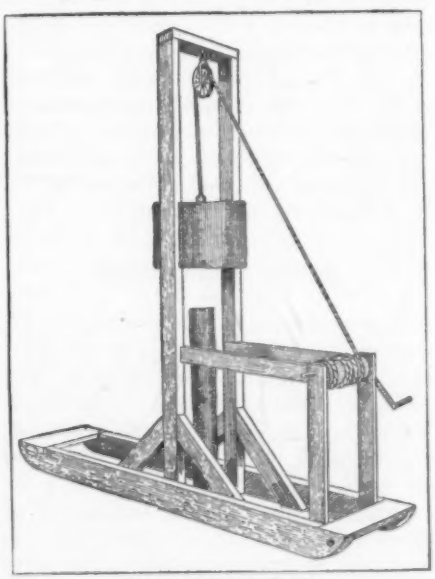


Details of Portable Truck

concrete mixer, etc. The frame and top are made of oak. The front and rear wheels are cast iron, 9 in. in diameter, with a 2¼-in. tread and fitted loosely on the axles, which are 1¼-in. square iron, except where the wheels turn, and bolted to the under side of each end of the truck with four ½-in. carriage bolts. The two center wheels are cast iron, 10 in. in diameter, with a 2¾-in. tread. These wheels are fitted loosely on a 1¼-in. square iron axle with a double crank in the center. This axle extends 2 in. over on one side of the frame to receive an iron lever. The axle is fastened to the frame with four iron boxes. The two brake beams are made of oak 1¾ in. thick, 3 in. wide and 2 ft. 3 in. long, shaped at each end to fit the front and rear wheels and covered on the ends with belt leather. These brake beams are suspended by four ⅜-in. round iron brake hangers fastened at the top by ⅜-in. rods, and to each brake beam with ⅜-in. eye bolts. The centers of the brake beams are connected to the cranks on the center axle with two iron brake rods having removable straps at one end and ½-in. eye bolts at the other end. An iron lever is keyed to the extending end of the middle axle and when this lever is thrown forward the cranks will push the brakes under the end wheels far enough to raise the center wheels from the floor, making the truck stand rigid while the motor is running. Pulling the lever backward removes the brakes and lifts them from the floor and back from the wheels. The center wheels will then rest on the floor, bearing the entire weight of the truck and motor. This truck can be turned in a small space, as the weight rests on the center wheels only when the brakes are removed by the lever.—Contributed by D. H. Utter, Sayre, Pa.

How to Make a Post Driver

A small post driver built on the plan of a common pile driver is a handy device for the farm, says Missouri Valley Farmer. The accompanying sketch shows the construction of such a post driver, which is built on two runners of 2- by 6-in. material 8 ft. long. The upright pieces are 2- by 4-in. pine 12 ft. long. These pieces should be well braced to the runners. The windlass is 6 in. in diameter, and is supported to the uprights and runners with 2- by

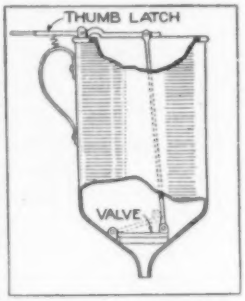


Driving Fence Posts

4-in. pine. A 1-in. rope runs over the windlass and over a 12-in. pulley that is attached to the top crosspiece. The weight is 16 in. in diameter and 2 ft. long, with a 4-in. groove, 2 in. deep, cut in each side, into which the uprights fit loosely.

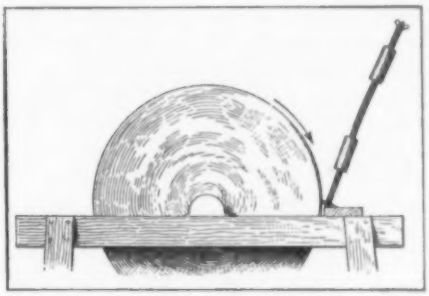
Home-Made Oil Can

This can, as illustrated, was designed for use in filling sight-feed oil cups. The body and neck of the can are made of sheet copper 3½ in. in diameter and 5 in. deep. A seat for the valve can be made from a piece of brass pipe and soldered to the bottom of the can, says Practical Engineer. The valve is made from a brass hinge with a leather disk attached to one side to fit the valve seat and the other side attached to the can. The latch, which runs up to the top of the can, is made of wire. When this can is once used the engineer will not go back to the ordinary kind.



Truing Up a Grindstone

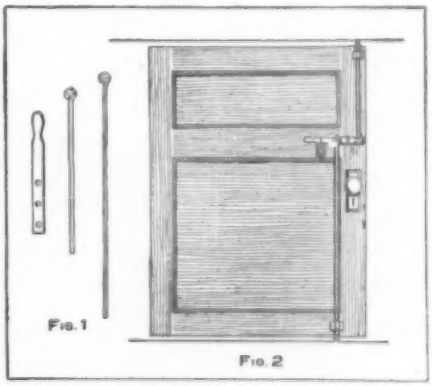
Nail a soft piece of wood across the frame and close to the stone, leaving just room enough to allow the face of the stone to pass. The truing tool is made from an old mower section cut rounding and about as large as a silver half-dollar, says Blacksmith and Wheelwright. A ⅜-in. square hole is punched in the middle of this cutter. All the work of forming and punching the hole must be done cold so as to leave all the temper in the tool. Two wooden blocks are placed on a 3-ft. length of ½-in. gaspipe for holders, placing them about 18 in. apart. Put a rod through the gaspipe and square the end to pass through the cutter. This end may be riveted or a thread made and a nut supplied to hold the cutter in place. A nut and washer placed at the other end will complete the truing tool. Turn the stone toward the cutting tool with plenty of power and hold the tool at right angles. A stone can be trued in short order by this method.



Making a Grindstone Round

How to Make a Double Bolt for a Door

The back doors of stores and those of warehouses are usually bolted with a bar or double bolts. A strong and durable double bolt for fastening such a door at the top and bottom can be made as shown in the sketch. Drill three holes in one end of a piece of flat iron about 3 in. apart and make a handle on the other end. Cut two iron rods so that their combined length will be about 4 or 5 in. over the length of the

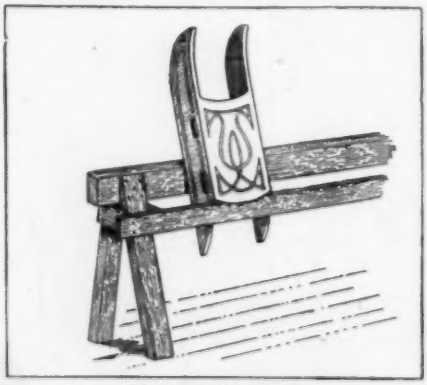


The Double Bolts on a Door

door. Make an eye on one end of each rod as shown in Fig. 1. Bolt these two rods to the flat iron, using the two outside holes that were drilled. Fasten the assembled pieces to the door with a lag screw put through the middle or remaining hole in the flat iron. A spring is attached to the flat iron or handle to hold the bolts in the recesses. Each rod is supported near the edge of the door with a guide made from sheet metal. The guides are formed to fit the rods and are fastened to the door with screws. Fig. 2 shows the bolt as it is fitted to the door.—Contributed by Waldo L. Whitmarsh, Phœnix, R. I.

Convenient Rack for Displaying Hand Sleds

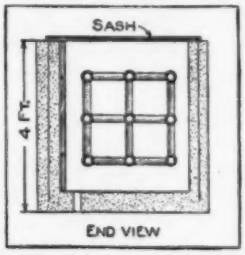
A home-made rack that will display hand sleds in an attractive manner and takes up little room is now used by several sporting goods stores, says the Sporting Goods Dealer. This rack permits the sleds to be placed upon it so that they will take up but little space, and at the same time are shown to the very best advantage. When sleds are exhibited by means of this rack the rear ends of the runners go under the lower bar of the rack, while the runners farther front rest on the middle and higher bar of the rack. This device can be made in any length and size to fit the space provided for the display. The legs can be of any length, but are usually made from 4 to 6 in. in length. The advantage of this sled rack is considerable when a large stock of sleds is carried, and by its use some sleds may be stood on the floor while the front portion of the runners rest on the lower bar.



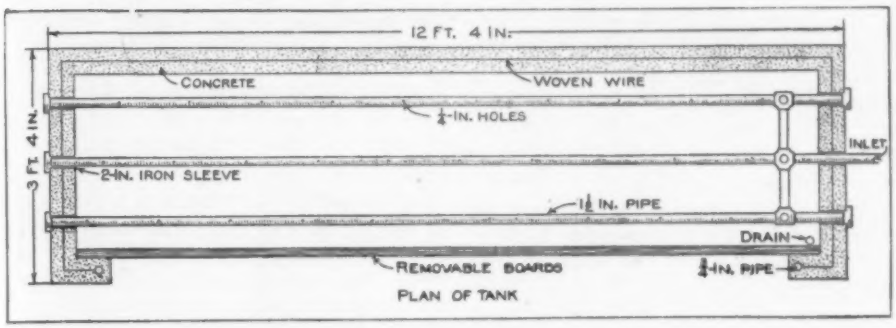
Sled Display Rack

How to Sterilize the Soil

The ravages of the nematode is confined to the root system of plants and the most serious injury comes, not in a direct way, but through its interference with the absorptive function of the roots; hence the wilting of the leaves. As a result of their presence, the plant becomes weakened and enfeebled and is therefore liable to become affected with other diseases. The range of plants affected by the nematode is quite large, and in our own experience the cucumbers seemed to be affected worst and the tomato next, says a correspondent of Florists' Review. Lettuce was not troubled. A number of the flowering plants, such as roses and carnations, are also inhabited by it.



As to methods of treatment, which is perhaps the point of special interest, we first tried impregnating the soil with certain chemicals, such as nitrate of soda, lime, etc. These had but little effect and were not to be relied upon. We then tried a method of steaming the soil. The term "sterilization," which has been used to designate this process, is really a wrong name. The term "steaming the soil" would really be more appropriate. In applying the treatment, the soil is placed in a tank, through which a number of steam pipes are run. These pipes are perforated every foot or less. After the tank is filled with soil and covered, a pressure of about 50 lb. of steam is turned into it for a period of about 2



Steam Pipes in the Tank

hours. Through the accumulation of heat, a temperature of from 180 to 200 deg. is secured. This excessive heat destroys the eggs and live nematodes.

There are also certain other benefits accruing from this treatment. Eggs of plant lice and other insects are destroyed, as are also weed seeds. Certain spores of fungous diseases, such as mildew, are also killed. The treatment also has a good influence in rendering more available the plant food of the soil. Heat accelerates chemical action, and it has been noticed that when soil has been treated the growth is more vigorous, due to the fact that the organic matter in the soil is more rapidly broken down.

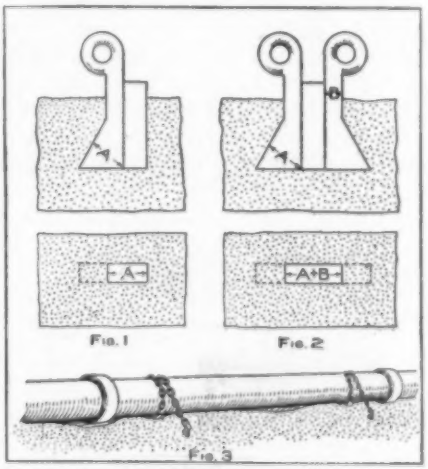
The cost of making such a tank, 3 ft. 3 in. wide, 4 ft. high and 12 ft. 4 in. long, for steaming the soil is as follows:

2¾ bbl. cement	$ 4.95
2¼ yd. gravel	.55
4 16-ft. planks	3.85
23 ft. 46-in. woven wire fencing	.65
135 ft. 1½-in. wrought iron pipe	14.85
3 ft. 2-in. wrought iron pipe	.60
6 1½-in. tee connections	.66
2 1½-in. tee connections	.22
1 1½-in. tee connection	.22
17 1½-in. plugs	.85
9 2-in. caps	.90
	$28.30

The top may be covered with hotbed sashes, as the work is done during the summer, when these are idle. It will be noticed that on one side boards are used. This is quite a convenience, as they may be lifted and the soil shoveled out from below. A concrete tank of this kind may be readily constructed by anyone. Ordinary woven wire fencing is used for reinforcing the walls and ¾-in. piping at the corners for reinforcement. The ¼-in. holes drilled in the pipe are about 6 in. apart and the iron sleeve set in the cement with an outside cap covering.

How to Anchor Submerged Pipe

In anchoring a submerged pipe in the stone bottom of a river, it was quite a problem to figure out some means to attach the holding chains to the stone. The accompanying sketch shows how a device was constructed for this purpose. In Fig. 1 is shown a single forging made with an eye in one end and a wedge-shaped foot on the other. A hole was cut in the stone of the river bed, deep and wide enough for the foot

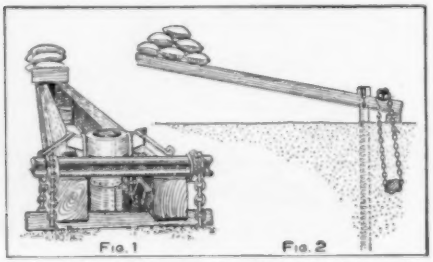


Anchors for Submerged Pipes

of the forging to fit in, and a block of iron large enough to fill the remaining space was driven in as a wedge. The length of the opening in the stone was cut a little longer than the dimension marked A, the width being the same as the forging. In Fig. 2 is shown a similar device with two forgings instead of one. In this case the opening in the stone was cut the same as with one forging plus the width of the forging at the point marked B. The wedge was driven in between the two forgings. Chains were wrapped around the pipe and anchored down to these forgings as shown in Fig. 3.—Contributed by I. C. Bailey, Cape May Point, N. J.

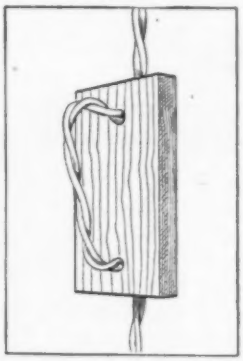
Novel Way of Putting in a Well Casing

A well casing about 8 in. in diameter was sunk to the depth of 400 ft. by a method of pushing the casing into the earth with the use of a heavy weight and levers. The long levers are 6 by 14 in. and 24 ft. long. The farther ends of them, as shown in Fig. 1, are loaded with about 2,000 lb. of sand in sacks and boxes. This weight is raised by horse power, using a block and tackle over a derrick, about 12 ft. The chains are then tightened or a new grip taken and the weighted end tripped, allowing the leverage from the heavy weight to push the casing into the earth. The ends of the heavy beams near the casing are anchored by a railroad rail and heavy chains to a large piece of timber buried about 7 ft. under the ground, as shown in Fig. 2. The great pressure drives the riveted pipe without injury.



Pushing a Well Casing into the Ground

Home-Made Drop Light Adjuster



The adjuster is made from a piece of wood $\frac{3}{8}$ in. thick, 2 in. wide and 3 in. long. Bore a $\frac{1}{4}$-in. hole $\frac{1}{2}$ in. from each end. Put the flexible lamp cord through the holes as shown in the illustration. This size hole will accommodate the standard gauge of flexible cord, but holes can be bored to fit any size wire. The length can be adjusted by pulling the cord through the holes as shown.

Luminous Paints

Some very good formulas for mixing the different colored luminous paints come from the Era Formulary. They are as follows:

Orange: 46 parts of varnish are mixed with 17.5 parts prepared barium sulphate, 1 part prepared India yellow, 1.5 parts prepared madder lake and 38 parts of luminous calcium sulphide.

Yellow: 48 parts varnish, 10 parts prepared barium sulphate, 8 parts barium chromate and 34 parts luminous calcium sulphide.

Green: 48 parts of varnish, 10 parts prepared barium sulphate, 8 parts green chromic oxide and 34 parts luminous calcium sulphide.

Blue: 42 parts of varnish, 10.2 parts prepared barium sulphate, 6.4 parts ultramarine blue, 5.4 parts cobalt blue and 46 parts luminous calcium sulphide.

Violet: 42 parts varnish, 10.2 parts prepared barium sulphate, 2.3 parts ultramarine violet, 9 parts cobalt arsenate and 36 parts luminous calcium sulphide.

Gray: 45 parts of varnish, 6 parts

prepared barium sulphate, 6 parts prepared calcium carbonate, 0.5 part ultramarine blue, 6.5 parts gray zinc sulphide.

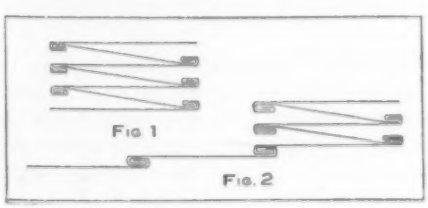
Yellowish-brown: 48 parts varnish, 10 parts precipitated barium sulphate, 8 parts auri-pigment and 34 parts luminous calcium sulphide.

Luminous colors for artists' use are prepared by using pure East India poppy oil, in the same quantity, instead of the varnish, and taking particular pains to grind the materials as fine as possible. For luminous oil color paints equal quantities of pure linseed.oil are used in the place of the varnish. The linseed oil must be cold pressed and thickened by heat.

The luminous paints can also be used as wax colors for painting on glass and similar objects, by adding, instead of varnish, 10 per cent more of Japanese wax and one-fourth the quantity of the latter of olive oil. The wax colors prepared in this way may be used for painting on porcelain, and are then carefully burned without access of air. Paintings of this kind can also be treated with water glass.

Folding Lock Seams When Laying Roofing Tin

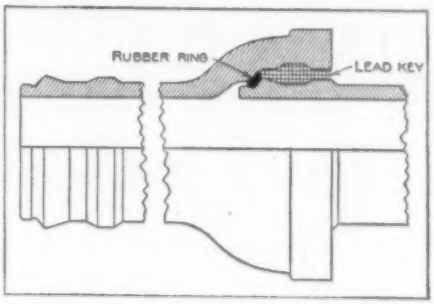
The usual method employed by tinners when putting on tin roofs is to fold each piece of tin separately, after which they slide one fold into the other and then hammer the seam tight with a mallet. Considerable time can be saved by laying both sheets together, one on top of the other, and with the use of the folding iron fold both at once, after which the sheets can be opened the same as two leaves of a book, then the seam is secured in the usual manner. Fig. 1 shows how the pieces are put together and Fig. 2 the method of unfolding them.—Contributed by W. O. Hay, Camden, S. C.



Unfolding the Lock Seams

New Joint for Cast-Iron Pipes

A new joint construction for cast-iron pipe, as shown in the illustration,



Flexible Pipe Joints

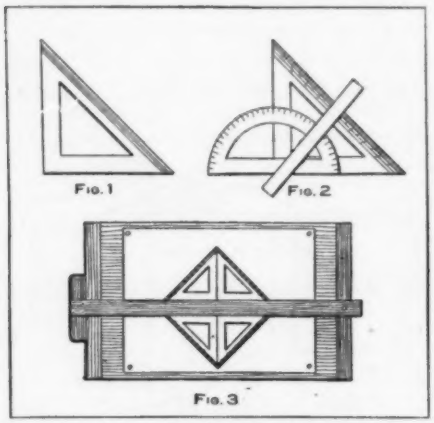
makes an absolutely tight joint and at the same time one that gives an unusual degree of flexibility without loosening it. A series of circular shoulders are cast in the pipe, into one of which is inserted a ring of vulcanized rubber. The rubber is depended upon chiefly to secure the tight joint. The rubber is backed up with a circular lead key which takes the shearing stresses produced by longitudinal compounds of the pressure, or any other shocks that may come upon the pipe.

Removing a Splinter from the Hand with Steam

A splinter that has been driven into the flesh can be removed by the aid of steam. Secure a wide-mouthed bottle and fill it nearly full of hot water, place the injured part over the bottle's mouth and press slightly, says National Magazine. The action thus produced will draw the flesh down, and in a minute or two the steam will extract the splinter, also the inflammation.

How to Make a Protractor on a Triangle

A very handy protractor can be made on a 45-deg. triangle by drawing with a pencil three lines parallel with the hypothenuse, as shown in Fig. 1, and



Drawing Angles Within the Four Quadrants

on these lines marking the divisions for the protractor. This is done by laying a protractor carefully on the triangle with its zero line on one and the 90-deg. line on the other of the two equal sides of the triangle. If a paper protractor is used a little paste will keep it in place; paper clips or some other method must be used with a metal or celluloid protractor.

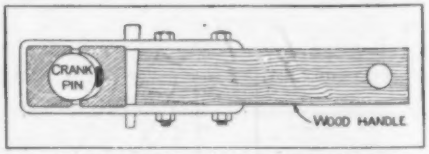
Place a straightedge exactly on the right angle triangle and on the first degree line, as shown in Fig. 2, and scratch a line with a sharp-pointed instrument on the triangle to the first parallel line. Extend to the second line all the 5-deg. lines, and to the third all the 10-deg. lines. A needle stuck through an erasing rubber will make a very good scratching point. Set off the degrees real fine and never scratch two times on the same line. After marking all the angles remove the protractor and clean the triangle. Number the degrees, marking every fifth or tenth as desired. As shown in Fig. 3, any angle within the four quadrants can be set off very easily.—Contributed by H. A. Sivas, Columbus, O.

How to Straighten a Bent Crankshaft

A crankshaft that is not too badly bent may be straightened in the following manner: Heat evenly the part that is bent, and then quickly mount the shaft in the centers of a lathe where it can be turned to determine the high point. This point having been found the shaft should be turned in a position so the high point will be directly down. A stream of cold water is now applied to the underneath, or high part of the bend, which will shrink the part of the shaft at this point quickly and thus bring the shaft to its former shape. Repeating the operation a few times may be necessary. This method has been found excellent for truing up cold rolled shafting.

How to True Up an Engine Crank Pin

An engine crank pin that has become a little flat can be turned or trued up with a device constructed as shown in the sketch. Disconnect the engine and use the strap and brasses for a tool, says American Miller. Take a piece of wood 15 in. long and fit it in the strap in place of the connecting rod. Bore a hole in the outer end and put a wooden pin in for use as a handle. Secure a flat file about 1½ in. wide—one that has been used some will do. Break off a piece of the file a little longer than the crank pin and grind the ends square so the piece will be as long as the crank pin when squared. Smooth off the



Wood Handle Placed in the Strap

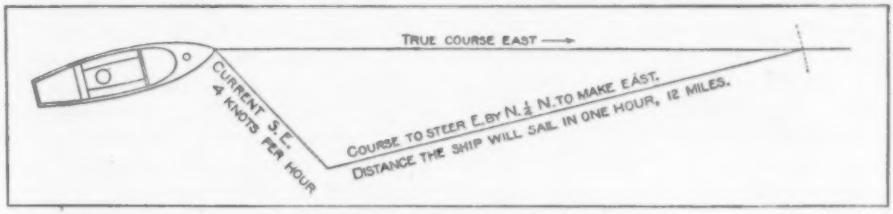
rough edges of the beards a little by rubbing it on an oilstone so that each beard of the file will be a cutting edge.

Slip back one of the brasses far enough to allow the piece of file to go

in lengthwise with the pin. Make a key narrow enough to insert in the key mortise. Use the device as a crank by turning it around. Oil freely and set up the brasses by tapping the key lightly. After turning a few minutes, stop and clean the pin, then repeat the operation.

Current Sailing

To find the course to counteract a current lay off from the ship's position on the chart the course you want to make good; next lay off from the ship's position the direction the current sets, also its rate for one hour; then with your dividers take the distance the ship will sail in one hour; place one point of the dividers at the end of the current for one hour, and let the other point touch the course you want to make good. A line from one of those points to the other will show the course you must steer to counteract the current, says the Marine Review. If there is any deviation at the point of the ship's head, it must be allowed.


TRUE COURSE EAST
CURRENT S.E. 4 KNOTS PER HOUR
COURSE TO STEER E.BY N.¼ N.TO MAKE EAST.
DISTANCE THE SHIP WILL SAIL IN ONE HOUR, 12 MILES.

The Course Drawn on the Chart

For example, suppose you are in a current which sets SE at the rate of four knots per hour, and you are steaming at the rate of 12 knots per hour, and want to make a due east course, what course must you steer to counteract the effect of the current? It is found as follows:

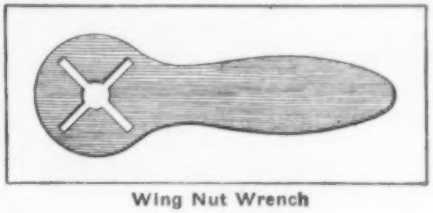
First, draw a line from the ship's position to represent the course you desire to make good, which in this case is east.

Second, set off from the ship's position the direction and distance the current runs in one hour, which is SE 4 miles. Mark this with a dot of your pencil.

Third, measure with your dividers the distance the ship will sail in one hour, which in this case is 12 miles. Place one foot of the dividers on the pencil dot you made for the current and let the other touch the true course, and where it touches the true course mark it with another pencil dot; then take your parallel rulers and find the course between your two pencil dots, which in this case gives the course as E by N ¼ N, which is the course you must steer to make your due east course good. Remember, this course is good only for one hour.

Wrench for Thumb Nuts

Thumb nuts are intended to be set up by hand, but sometimes it is very convenient to use some kind of tool to turn them tighter than can be turned by hand, says the Horseless Age. For such a purpose the simple little tool illustrated will be found convenient. This tool or wrench is made of flat stock $\frac{3}{16}$ in. thick. The handle is made in various sizes, according to the size of the thumb nut, this being determined by taking five times the distance across the wings of the nut for the length of the handle. Two slots are cut at right angles to each other in the circular part

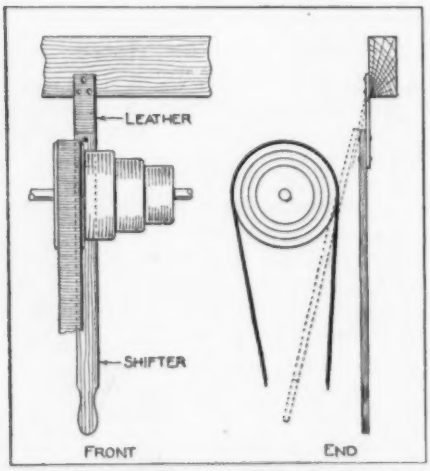


Wing Nut Wrench

of the wrench, as shown. At their intersection the central opening is enlarged so as to permit the screw on which the thumb nut turns to enter.

A Cone Belt Shifter

The usual method of shifting a belt on a cone drive for a lathe, drill press or milling machine is to use a pole to push the belt from one cone to another. The accompanying sketch shows a method used in a large factory on all the cone drives. The shifter is erected by fastening a piece of leather, about 3 in. long, to a beam or other falsework above the countershaft and not more than 2 in. back of the largest cone pulley, says The Phœnix. A shifting lever made of wood is secured to the loose end of the leather, and when the



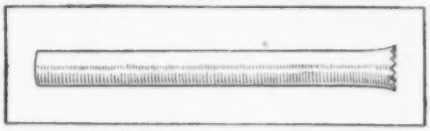
Shifter for Changing Belts on Cones

operator desires to change the machine speed he reaches through the belt, grasping the shifter, and pulls it around against the belt to shift it to the desired cone. If the shifter is hung about half-way between the two largest steps on the countershaft cone it will change the belt the whole length of the countershaft cones, and eliminate the use of the pole.

Use shellac varnish for attaching letters to wood patterns.

Drilling Through a Brick Wall

Secure a piece of ordinary gaspipe the size of the hole that is to be cut into the brick wall. Heat one end of the pipe and drive it on the horn of an



Drill Made from Gas Pipe

anvil, making the end slightly larger. File teeth in this enlarged end, making the sides of the teeth about 90 deg. angle with each other. Caseharden the teeth and the drill is complete. The enlarged end on which the teeth have been cut will bore a hole through the brick large enough to clear the entire length of the pipe.

Pure Air in the House

At this season of the year when the air outside our dwellings has the chill of winter, the housekeeper aims to keep the air within doors at a moderate temperature by artificial heating. Frequently the doors and windows are closed and carefully barricaded to keep the house warm, says Good Health. With the inlets for fresh air stopped and no outlets for foul air provided, the result is a great deficiency in oxygen. No one can keep in perfect health and maintain the resistance to disease without a plentiful supply of oxygen from pure fresh air.

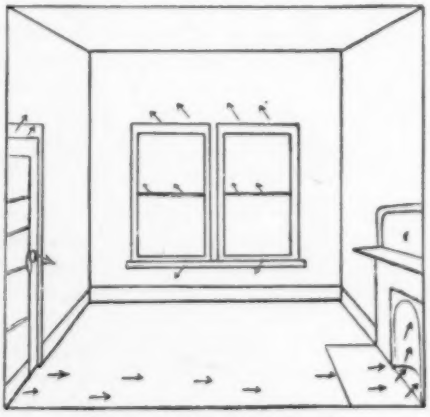
Air contamination is occasioned not alone by the lack of ventilation, but also by the lack of care in removing the germ-laden dust particles which find their way into every nook and corner.

Various gases and vapors, the product of the household heating, lighting and cooking are another source of indoor-air contamination, which if not removed by proper ventilation permeate the house, condensing upon all surfaces, carrying the dust and air along

with them, and fastening securely to whatever they come in contact.

Air within doors is air in confinement and comparatively still. If it becomes polluted, there is no way to purify except to be replaced with that which is fresh and pure.

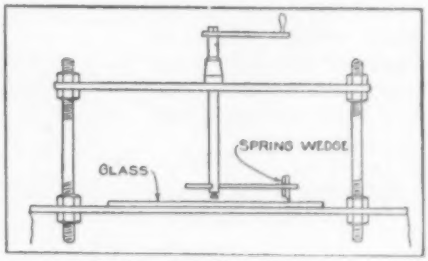
Air does not move of its own accord. A current must in some way be established. One of the best means of obtaining the needed supply of fresh air is the open fire-place with a wide-mouthed chimney to act as a ventilator. The open grate is likewise the most healthful means of heating a house. If a plan of ventilation is constructed it should be like that of the fireplace—an opening near the floor connected with the chimney or an upright ventilating shaft. The size of the opening depends upon the number of people to be supplied with air. An opening equal to that of 2 in. wide and 12 in. long should be provided for each individual. This should be free space and if covered with grating the size of the opening must be at least one-half larger. This opening should communicate as directly as possible with an upright shaft of equal size, the top of which should extend above the roof like a chimney. The ventilating shaft should always be located in an inside wall, and, if possible, should be placed next to a chimney which is always warm. Two openings must be provided to secure proper ventilation: one for the entrance of fresh air and the other for the exit of foul air. It is in every way better that the air should be heated, at least partially, before it enters the room, as this will to a large degree prevent the formation of a cold layer about the floor.



Arrows Show Air Currents

A Pressure Gauge Glass Cutter

In the locomotive shops of a railroad a handy tool was devised for cutting circular steam or air pressure gauge glasses. Any sized glass can be cut with this device by changing the adjustable cutter arm, in which an ordinary diamond-point glass cutter is inserted at the end. The only part of the device that is difficult to make is the height adjuster. This consists of a sleeve running in a collar on the upright rod and on the thread in the framework.



Cutting the Glass Circular

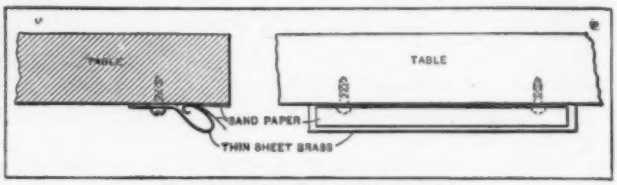
Repairing Stripped Threads on a Throttle Valve Stem

While out with a traction engine I stripped the threads on the stem of the throttle valve, and as we were 35 miles from where repairs could be obtained something had to be done to get the engine running as soon as possible. I took the valve stem to a blacksmith and asked him if he could fix it. He took a piece of small wire and wound around the stem, following the crease left from the old thread. The wire was tinned, soldered and dressed with a

three-cornered file. The stem was then put in place and has been in use for more than a year.—Contributed by A. R. Kibbe.

Pencil Sharpener

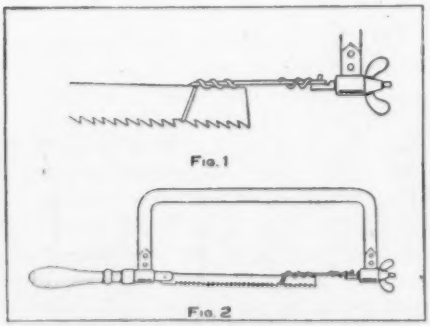
The accompanying sketch shows a pencil sharpener or pointer for draftsmen. As seen from the illustration, it consists of a thin spring brass bent to the form shown and fastened under the table near the edge by two round-head wood screws, says Machinery. The sandpaper is held between the table and the brass spring. Slip the point of the lead pencil between the leaves of the sandpaper and move the pencil back and forth.



Detail of the Pencil Sharpener

Another Way to Use a Broken Hack-Saw Blade

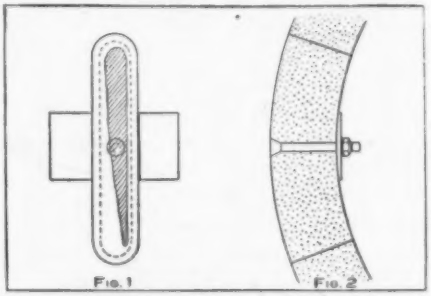
File a notch about 1 in. from the broken end of the blade and take a piece of wire and make a loop over the blade into the notch, as shown in Fig. 1. Put the blade into the frame and hook the end of the wire over the small pin in the adjusting screw of the frame. The twisted ends of the wire will hold, but it is better to solder the ends. The saw is tightened in the frame, as shown in Fig. 2, in the usual manner.—Contributed by J. W. Gale, Washington, D. C.



Holding the Broken Saw Blade

Repairing a Printing Press Cylinder

Sometimes a dent or bruise is made on a printing press cylinder or surface of the bed that will require taking the machine apart and machining the damaged surface. The indentation may be too deep for machining and of such a size that the depression cannot be filled with a steel pin driven in tightly and filed off smooth. In such an instance the dent was made by a quoin and the cylinder could not be turned off, nor would a pin fill the depression. A slot was cut through the cylinder, a piece made from metal in the shape shown in Fig. 1 and fitted into the slot as shown in Fig. 2. The piece was cut sloping, also the sides of the slot, so the bolt would draw the parts tightly together, forming a close joint. A plate of metal extending over on each side of the piece was used in connection with the bolt to hold the piece in position. The outside surface was dressed off smooth on the same curve as the cylinder. The work was so well done that, aside from the dissimilarity in the structure of the metals, the joints could not be detected.—Contributed by Donald A. Hampson, Middletown, N. Y.

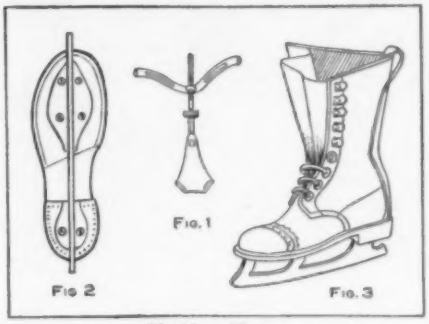


A Wedge Put in the Cylinder

Amateur Mechanics

How to Make Skating Shoes

Remove the clamp part, as shown in Fig. 1, from an ordinary clamp skate. Drill holes in the top part of the skate for screws. Purchase a pair of high

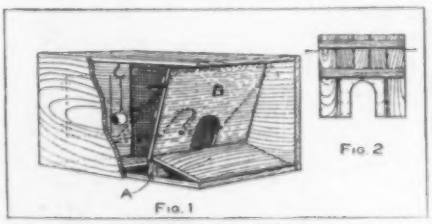


Skating Shoes

shoes with heavy soles and fasten the skates to the soles with screws as shown in Fig. 2. When completed the skating shoe will have the appearance shown in Fig. 3. These will make as good skating shoes as can be purchased, and very much cheaper.—Contributed by Wallace C. Newton, Leominster, Mass.

How to Make a Self-Setting Rabbit Trap

Secure a good-sized box, say 1 ft. high, 1½ ft. wide and 3 ft. long; and to the bottom, about 10 in. from one end, fasten a 2-in. square piece, A, Fig. 1, extending the width of the box. Place a 10-in. board sloping from the end of the box to the cleat A. The swing door, B, Fig. 1, is made as shown

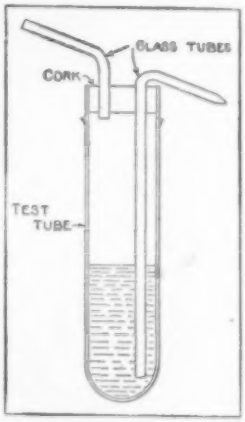


Self-Setting Trap

in Fig. 2, which represents the back side of the door. Sheet metal or tin is cut to the proper size and tacked around the edge of the hole. This prevents the animal from gnawing its way out, also provides a way to make the hole different sizes for squirrels or other animals. The hole in the door should be about 2 in. wide and 4 in. high for rabbits. The door is made to swing freely on two large nails driven through the sides of the box. The hole in the door being only large enough to admit a small portion of the rabbit's head, the rabbit will push its way through to the bait, causing the door to swing back and up, which will close of its own weight when the animal is inside. A small door is provided in the other end to remove the animals caught.—Contributed by H. F. Church, Alexandria, Va.

How to Make an Atomizer

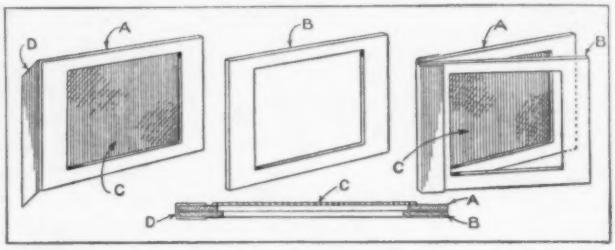
Secure a good sized test tube and fit it with a cork. Take two glass tubes having about ⅛-in. hole and bend them as shown in the sketch. This is done by heating them at the proper point over a gas flame until they are soft. Two holes are bored through the cork and the bent tubes inserted in them, as shown in the sketch, so that one of the tubes will extend nearly to the bottom of the test tube and the other just projecting through the cork. The spray tube may be made with a fine hole by first securing a tube longer than necessary and heating it at the proper point



and drawing the tube out into a fine thread. The thread is broken off at the proper place to make a small hole.

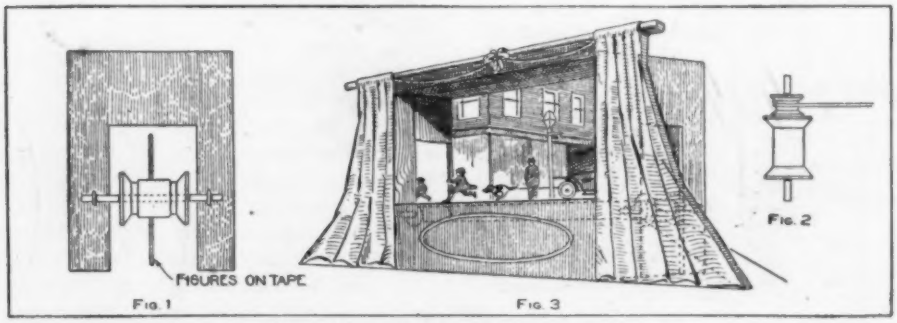
Home-Made Kits for the Camera

If you have a 5- by 7-in. camera and wish to use some 4- by 5-in. plates, make a few simple kits to hold the smaller plates and fit the larger holders, says Camera Craft. Take two pieces of pasteboard, A and B, black surfaced if possible, and exactly 5 by 7 in. in size. The piece A will form the back of the kit and should have an opening cut in the center 4 by 5 in. in size. Paste a piece of strong black paper, C, over the under side of it to keep the plate from falling through. Cut an opening in the other piece, B, but cut it $\frac{1}{4}$ in. shorter. This opening, being $\frac{1}{8}$ in. shorter at each end, will retain the plate in position and cut off only that small amount of plate surface when the plate is exposed in the camera. Cut a piece of thin black cloth, D, 1 in. wide and 5 in. long. Lay it down on a piece of newspaper and coat one side with gum or mucilage. Stand the two pieces of 5- by 7-in. black cards on end together so that they will be square and true and bind the other ends with the strip of cloth so as to form a hinge. The two cards form a thickness about equal to a thick glass plate, and go in the holder in the same way. Lay one of these kits down against the ground side of the focusing screen and draw a line around, inside of the opening. This will be a guide as to just what will be secured upon the smaller plate when the kits are used.



How to Make a Miniature Stage

A good smooth box, say 8 in. wide, 10 in. high and 12 in. long, will serve the purpose for the main part of this small theater. Cut two rectangular holes, Fig. 1, one in each end and exactly opposite each other. Place a screw eye about $\frac{1}{2}$ in. from the edge on each side of these openings. Fit an axle in the screw eyes and fasten a spool to the middle of the axle. On one of the two spools attach another smaller spool, Fig. 2, to be used as a driving pulley. Cut out the front part of the box down to a level with the top of the spools.



Details of the Miniature Mechanical Stage

Connect the spools with a belt made from tape about ¾ in. wide. On this belt fasten figures cut from heavy paper and made in the form of people, automobiles, trolley cars, horses and dogs. A painted scenery can be made in behind the movable tape. The front part of the box may be draped with curtains, making the appearance of the ordinary stage, as shown in Fig. 3. A small motor will run the spools and drive the tape on which the figures are attached.—Contributed by William M. Crilly, Jr., Chicago.

A Floating Compass Needle

When a thoroughly dry and clean sewing needle is carefully placed on the surface of water the needle will float even if the density of steel is 7 or 8 times that of water. A sewing needle thus floating upon water may be used as a compass, if it has previously been magnetized. The needle will then point north and south, and will maintain this position if the containing vessel is moved about; if the needle is displaced by force it will return to its position along the magnetic meridian as soon as the restraint is removed.

Home-Made Dog Cart

The accompanying photograph shows a boy with his "dogmobile." The photograph was taken when they were on a new pavement which had 2 in. of sand left by the pavers and a grade of 6 per cent. The machine is nothing more than a boy's rubber-tired wagon on which are mounted a box for a seat and a wheel steering device extending above and below the board of the wagon. The front wheels are guided by ropes attached from each end of the axle and a few turns around the lower end of the steering rod. A pair of shafts are attached to the rear, into which the dog is harnessed.

Dog-Power Cart

How to Make a Dry Battery Cell

Dry battery cells are composed of the same materials for the poles, but instead of the liquid commonly used a paste is formed by mixing sal ammoniac and other salts with water and packed in the cell so it cannot spill.

A cell of this kind can easily be made, and to make it the proper size a sheet of zinc 8½ in. long and 6 in. wide will be required. This zinc is rolled into a cylinder 2½ in. in diameter. This will allow for a lap of ⅝ in., which is tightly soldered only on the outside of the seam. Close one end of the cylinder by soldering a disk of zinc over it, making a watertight receptacle. All soldering should be done on the outside and none of the solder allowed to run on the inside of the seam. All seams on the inside should be painted with asphaltum in order to cover any particles of solder. Do not paint any surface, only the joints. Secure three carbon rods ½ in. in diameter and 6 in. long which are copper plated. Carbons used in arc lamps will do. File the rods to remove the copper plate, leaving about ½ in. of the plate at one end. Tie the three rods in a close bundle with the copper-plated ends together

and make a contact with each rod by soldering a wire to the plated ends, allowing one end of the wire to project about 2 in. for a connection. The plated ends of the carbons should be covered with paraffin for about 1 in. This is done by immersing them in a dish of smoking hot melted paraffin until the pores are thoroughly saturated.

The salts for filling are ¼ lb. zinc oxide, ¼ lb. sal ammoniac, ¾ lb. plaster of paris, ¼ lb. chloride of zinc mixed into a paste by adding ½ pt. of water. Form a ½-in. layer of paste in the bottom of the cylinder and place the ends of the carbon rods on this with their plated ends up. Hold the rods in the center of the cylinder and put the paste in around the rods with a stick. Pack the paste in, closely filling the cylinder to within ¾ in. of the top. This space at the top is filled with a mixture of ½ lb. of rosin and 2 oz. beeswax melted together. This wax seals the cell and prevents any evaporation. Connection is made to the zinc by soldering a wire to the outside of the cylinder.

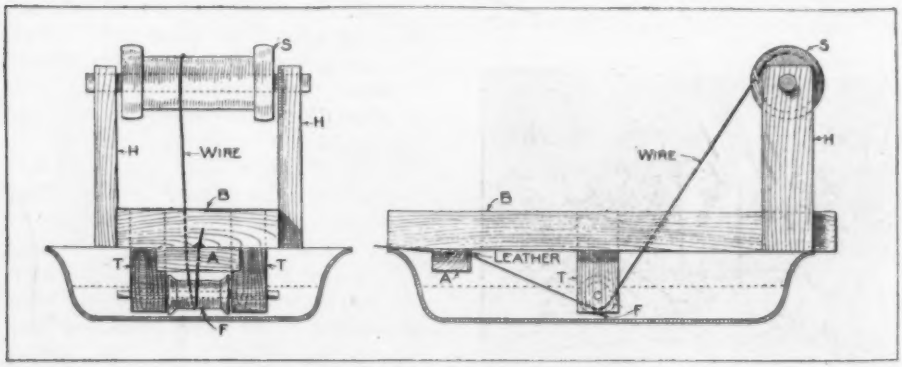
How to Paraffin Wire

The following description of how to make an apparatus with which to paraffin wire as needed makes clear a method of construction that is simple and easy to put together in a short time.

Secure a pan to be used for this purpose only; one that will hold about 1 qt. The details of the construction are given in the diagram, in which P is the pan; B is a base of 1-in. pine; S is the spool of wire supported near one end of the base by nailing on standards H and H; F is a spool, with narrow flanges, supported near the bottom of the pan by the standards T and T. These may be made of two short pieces of a roller fitted into the holes bored in the base; A is a block of 1-in. pine with a piece of leather tacked on one side. Four nails should be driven in the base just outside of the edge of the pan to keep it from sliding off the pan.

Bore a hole in the base between the two spools and pass the wire through this hole, under the spool in the paraffin, then through a small hole in the leather and a notch in the block A, and a notch between the base and the pan. Tie a string around the wire between the leather and the paraffin, making the knots so they will not pull through the hole in the leather. This makes the wire smooth, and by making the string tighter or looser you can regulate the thickness of the paraffin, says Electrician and Mechanic. Place the pan on the stove; when the paraffin is melted, pull out the wire as needed. To keep the pan from sliding place a flatiron or some other weight on it.

Peat is used in Germany for bedding, fodder, filter, fuel and packing purposes.

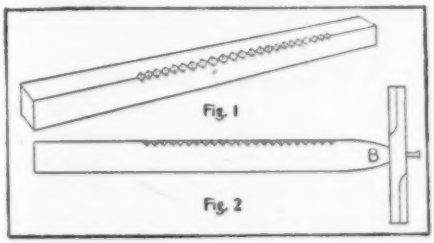


Home-Made Apparatus for Paraffining Wire

Scientific Explanation of a Toy

In a recent issue of Popular Mechanics an article on "The Turning Card Puzzle" was described and illustrated. Outside of the scientific side involved, herein I describe a much better trick. About the time when the expression "skidoo" first began to be used I invented the following trick and called it "Skidoo" and "Skidee," which created much merriment. Unless the trick is thoroughly understood, for some it will turn one way, for others the opposite way, while for others it will not revolve at all. One person whom I now recall became red in the face by shouting skidoo and skidee at it, but the thing would not move at all, and he finally, from vexation, threw the trick into the fire and a new one had to be made. Very few can make it turn both ways at will, and therein is the trick.

Take a piece of hardwood ⅝ in. square and about 9 in. long. On one of the edges cut a series of notches as indicated in Fig 1. Then slightly taper the end marked B until it is nicely rounded as shown in Fig. 2. Next make an arm of a two-arm windmill such as boys make. Make a hole through the center of this one arm. Enlarge the hole slightly, enough to allow a common pin to hold the arm to the end B and not interfere with the revolving arm. Two or three of these arms may have to be made before one is secured that is of the exact proportions to catch the vibrations right.



How to Cut the Notches

To operate the trick, grip the stick firmly in one hand, and with the forward and backward motion of the other allow the first finger to slide along the top edge, the second finger along the side, and the thumb nail will then vibrate along the notches, thus making the arm revolve in one direction. To make the arm revolve in the opposite direction—keep the hand moving all the time, so the observer will not detect the change which the hand makes—allow the first finger to slide along the top, as in the other movement, the thumb and second finger changing places: e. g., in the first movement you scratch the notches with the thumb nail while the hand is going from the body, and in the second movement you scratch the notches with the nail of the second finger when the hand is coming toward the body, thus producing two different vibrations. In order to make it work perfectly (?) you must of course say "skidoo" when you begin the first movement, and then, no matter how fast the little arm is revolving when changed to the second movement, you must say "skidee" and the arm will immediately stop and begin revolving in the opposite direction. By using the magic words the little arm will obey your commands instantly and your audience will be mystified. If any of your audience presume to dispute, or think they can do the same, let them try it. You will no doubt be accused of blowing or drawing in your breath, and many other things in order to make the arm operate. At least it is amusing. Try it and see.—Contributed by Charles Clement Bradley, Toledo, Ohio.

The foregoing article describing the "Skidoo-Skidee Trick" appeared in a recent issue of Popular Mechanics. I have been told that a similar arrangement is used by a tribe of Indians in the state of Washington, by the Hindoos in India, and one friend tells me that they were sold on the streets of our large cities many years ago.

This toy interested me so much that I have made an investigation into the causes of its action, and I think the results may be of interest.

To operate, one end of the notched stick is held firmly in the left hand, while with the right hand a nail or match stick is rubbed along the notched edge, at the same time pressing with the thumb or finger of the moving hand against the oblique face of the stick. The direction of rotation depends upon which face is pressed. A square stick with notches on edge is best, but the section may be circular or even irregular in shape.

The experiments were as follows:

1. A rectangular stick had notches cut on one face. When the pressure was applied upon a face normal to the first, no rotation resulted. If the pressure was upon an edge, rotation was obtained.

2. Irregular spacing of the notches did not interfere with the action. The depth of the notches was also unimportant, although it should be suited to the size of the nail for best results.

3. The hole in the revolving piece must be larger than the pin; if there is a close fit no rotation is obtained.

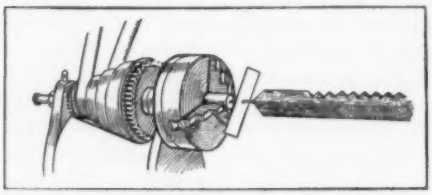
4. The center of gravity of the revolving piece must lie within the hole. If the hole is not well centered the trick cannot be performed.

5. If the stick be clamped in a vise no results are obtained; with this exception: if the stick has enough spring, and the end clamped is far enough away from the notched portion, the rotation may be obtained.

The above experiments led me to the conclusion that the operation of the device is dependent upon a circular motion of the pin, and this was confirmed by the following experiments. The action is somewhat similar to swinging the toy known as a locust around with a slight circular motion of the hand. It is necessary to show here that a slight

circular motion is sufficient to produce the result and, secondly, that such motion can be produced by the given movements of the hands.

6. A piece of brass rod was clamped in the chuck of a lathe, and a depression made in the end slightly eccentric, by means of a center punch. If the end of the pin is inserted in this depression,



The Lathe Experiment

while the hand holding the other end of the stick is kept as nearly as possible in the axis of the lathe, rotation of the lathe will produce rotation of the revolving piece. Speeds between 700 and 1,100 r. p. m. gave the best results.

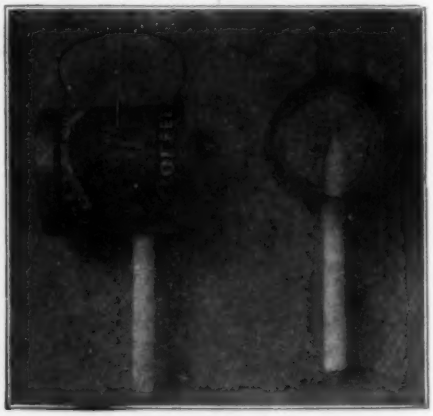
7. A tiny mirror was attached to the end of the pin, and the hand held in the sunlight so that a spot of sunlight was reflected upon the wall. The notches were then rubbed in the usual way. The spot of light upon the wall moved in a way which disclosed two components of motion, one circular and one due to the irregular movements of the hand holding the stick. Usually the orbit was too irregular to show a continuous and closed circular path, but at times the circular motion became very pronounced. It was observed and the direction of rotation correctly stated by a man who was unaware of the source of the motion.

The production of the circular motion can be explained in this way: When the rubbing nail comes to a notch the release of pressure sends the stick upward; this upward motion against the oblique pressure upon the (say) right hand side gives also a lateral component of motion towards the left. As the nail strikes the opposite side of the notch the stick is knocked down again, this motion relieves somewhat the oblique pressure from the right hand side, and the reaction from the holding (left) hand moves the stick to the right slightly, so that it is back in the old position for the next upward motion. Thus a circular or elliptic motion is repeated for each notch, and the direction of this motion is the same whether the nail be rubbed forward or back. For oblique side pressure from the right (notches assumed upward), the motion of the stick and hence of the revolving piece will be counter-clockwise; if the pressure is from the left, it will be clockwise.

That the motion of the revolving piece is due to a swinging action, and not to friction of the pin in the hole, is proved by experiments 3 and 4.—Contributed by M. G. Lloyd, Ph.D., Washington, D. C.

Home-Made Lantern

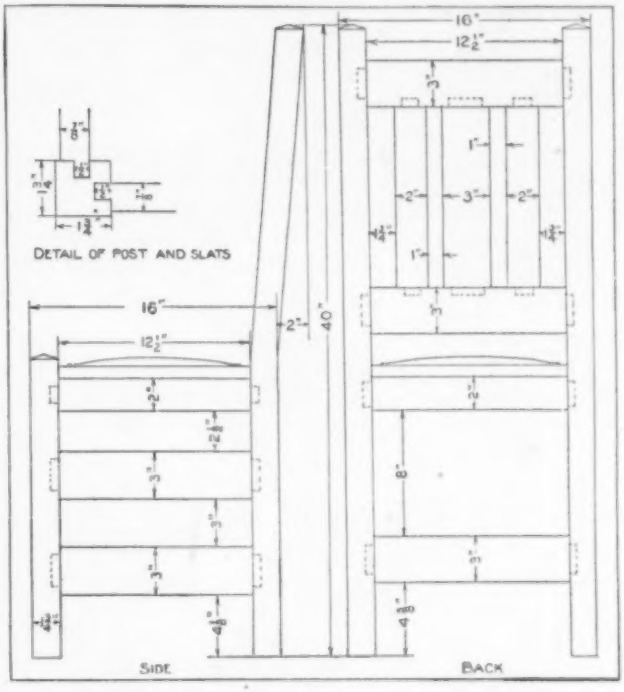
The accompanying picture shows a lantern which can be made almost anywhere for immediate use. All that is needed is an empty tomato or coffee can, a piece of wire and a candle. Make a hole a little smaller than the diameter of a candle and about one-third of the way from the closed end of the can, as shown. A wire is tied around the can, forming a handle for carrying. This kind of lantern can be carried against almost any wind and the light will not be blown out.—Contributed by G. A. Sloan, Duluth, Minn.



Tin Can Lantern

Home-Made Mission Chair

A mission chair suitable for the dining room can be made from any one of the furniture woods to match the other articles of furniture. The materials can be secured from the planing mill dressed and sandpapered ready to cut the tenons and mortises. The material list can be made up from the dimensions given in the detail drawing. The front legs or posts, as well as the back ones, are made from $1\frac{3}{4}$-in. square stock, the back ones having a slope of 2 in. from the seat to the top. All the slats are made from $\frac{1}{2}$-in. material and of such widths as are shown in the detail. The three upright slats in the back are $\frac{3}{4}$-in. material. The detail drawing shows the side and back, the front being the same as the back from the seat down. All joints are mortised in the posts, as shown. The joints, however, can be made with dowels if desired. If making dowel joints they must be clamped very tight when glued and put together. The seat can be made from one piece of $\frac{1}{2}$-in. material, fitted with notches around the posts. This is then upholstered with leather without using springs. Leather must be selected as to color to suit the kind of wood used in making the chair. The seat can also be made with an open center for a cane bottom by making a square of four pieces of $\frac{1}{2}$-in. material about 4 in. wide. These pieces are fitted neatly to the proper size and dowelled firmly together. After the cane is put in the opening the cane is covered over and upholstered with leather in the same manner as with a solid bottom.

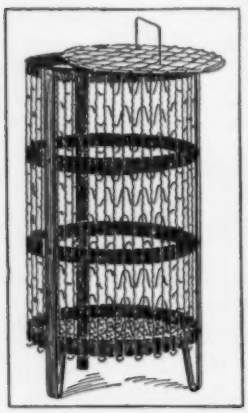


World's Whaling Record

The whaler "St. Lawrence" has broken the world's record by capturing 318 whales in one season, including 241 humpbacks, 66 sulphur bottoms, 10 finbacks, and one sperm whale.

A RECEPTACLE FOR BURNING RUBBISH

Fires are often started by flying pieces of burning paper or other articles when rubbish is being burned. This rubbish burner, designed for the disposal of waste paper and all kinds of rubbish which accumulates about the home, store, or office, is made of galvanized wire with iron supports that have been dipped in asphaltum.



The cage-like device not only keeps the rubbish from blowing about in the wind but holds it off the ground so that it will be thoroughly consumed.

A WATCH THAT COUNTS THE PULSE-BEATS

A watch that gives quickly and without calculation the number of beats of the pulse and heart in one minute is being placed on the American market by a French concern. The watch is also a chronograph as well as a good timekeeper, and is especially adapted for the requirements of physicians and nurses.

When used for calculating the beats of the pulse, the second hand stands at 12 or 0 and the large hand is set in motion by pressing a button in the crown of the watch. When the counting of the pulsations begins and the twentieth pulsation is reached, the motion of the large hand is stopped by another pressure on the button. The physician can then read on the edge of the dial the number of pulsations per minute.

AMERICAN MECHANICAL GENIUS VICTORIOUS

Telephone Exchange in Sixty Days

Some few months ago the main telephone exchange in Paris was destroyed by fire, almost paralyzing the business interests of the French capital. Messengers were the only substitutes for telephones possible and business transactions were delayed. The French government immediately began canvassing the Paris electrical manufacturers, as the French telephone and telegraph lines are government properties, and there is an unwritten although well defined law in France that all government work shall be done by Frenchmen.

The manufacturers, however, confessed themselves entirely unequal to the task of filling the contract demanded in the short time specified, which was 60 days from the filing of the specifications. English, German and Austrian firms were then sounded, but they demanded from six to eight months. A large American firm with headquarters in Chicago and a branch in Paris, snapped up the offer.

The specifications were turned over to the American electrical company, and for 14 days and nights the plant near Chicago was rushed to get together the 10,000-trunk switchboard and the connections which the work required. Then the equipment was loaded on a special train of eight cars, hurried to New York and transferred to "La Province." The entire contract was finished before the 60 days expired.

There are almost 4,000 miles of single wire in the Paris switchboard, which is about 200 ft. long and requires over 100 operators to handle it. The shipment also included 28 miles of telephone cable. The total cost of the work was $500,000.